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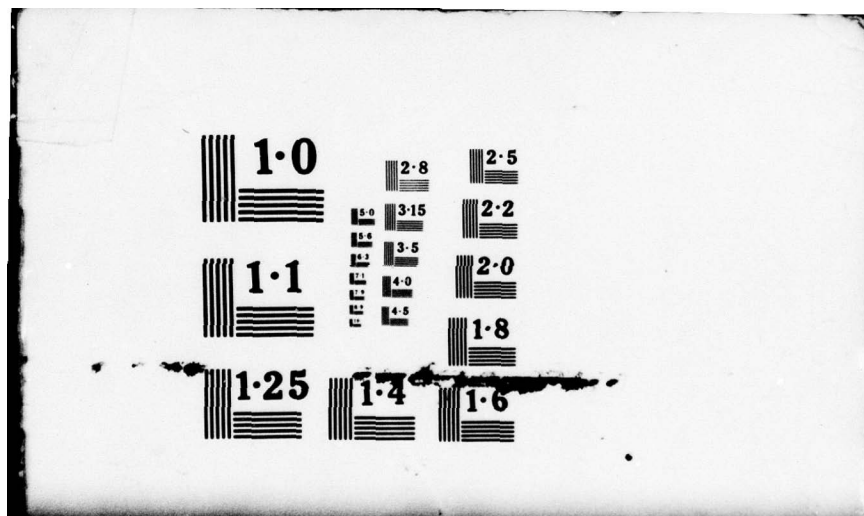
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Phase Report

January 1979



# COMPUTER PROGRAM MAINTENANCE MANUAL FOR THE ANTENNA PATTERN DISTORTION COMPUTER PROGRAM - VERSION IV

Syracuse University

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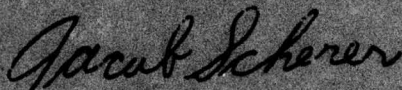
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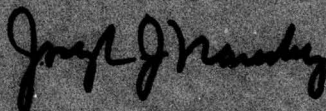
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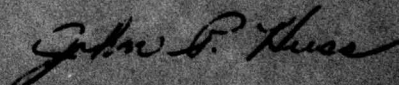
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19. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes in reasonable detail the Antenna Pattern Distortion Computer (DISTORT) so that any software maintenance or modification can be carried out without much difficulty. A description of every subsystem, program and subroutine as well as all the file requirements is given and is accompanied by detailed flow charts.		

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## PREFACE

This effort was conducted by Syracuse University under the sponsorship of the Rome Air Development Center Post-Doctoral Program for Rome Air Development Center. Mr. Marvin Hirshman (EEIT) and Capt. Jerry Rintella (EEIMC), 1842 EEG, were the task project engineers and provided overall technical direction and guidance.

The RADC Post-Doctoral Program is a cooperative venture between RADC and some sixty-five universities eligible to participate in the program. Syracuse University (Department of Electrical Engineering), Purdue University (School of Electrical Engineering), Georgia Institute of Technology (School of Electrical Engineering), and State University of New York at Buffalo (Department of Electrical Engineering) act as prime contractor schools with other schools participating via sub-contracts with prime schools. The U.S. Air Force Academy (Department of Electrical Engineering), Air Force Institute of Technology (Department of Electrical Engineering), and the Naval Post Graduate School (Department of Electrical Engineering) also participate in the program.

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Electronics Systems Division (ESD), Air Force Avionics Laboratory (AFAL), Foreign Technology Division (FTD), Air Force Weapons Laboratory (AFWL), Armament Development and Test Center (ADTC), Air Force Communications Service (AFCS), Aerospace Defense Command (ADC), HQ USAF, Defense Communications Agency (DCA), Navy, Army, Aerospace Medical Division (AMD), and Federal Aviation Administration (FAA).

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## 1. GENERAL DESCRIPTION

### 1.1 Purpose of the Program Maintenance Manual

The objective of this Computer Program Maintenance Manual for the Antenna Pattern Distortion Computer Program is to provide the maintenance programmer personnel with the information necessary to effectively maintain the system.

### 1.2 System Application

The Antenna Pattern Distortion Computer Program calculates antenna coupling coefficients, vertical and horizontal radiation patterns, communication range contour and pattern distribution of antenna farms such as those found in many AF air-to-ground communication stations.

### 1.3 Equipment Environment

1.3.1 Computer. Honeywell 6180, GCOS SRH.2 and HP 7202A Graphic Plotter.

1.3.2 Input/Output Devices. (a) on-line disks  
(b) terminal

Keyboard

Printer

Plotter

### 1.4 Program Environment

1.4.1 Programming Language. With the exception of three GMAP (Honeywell DD08A) subroutines, YSFUTL, PACK, DIMXXX, all programs and subroutines are written in series 60 (level 66)/6000 FORTRAN (Honeywell DD-02)

### 1.4.2 Mode of Processing

The program is in the time sharing mode for the inputting of data. Although the main calculations have to be done in the remote batch mode (CARDIN), this is completely transparent to the user since the CARDIN JOB is



spawned by the time-sharing program with the use of specially written utility subroutines.

The subsystems /RADIO/DISTORT and /RADIO/DISTORTP have been compiled and are stored in files with these names in the user library of AFCS.LIB so that they can be accessed as follows:

- a. In response to "SYSTEM?" type FORT NEW
- b. The computer will print  
READY  
\*
- c. Type RUN AFCS.LIB/RADIO/DISTORT (or RUN AFCS.LIB/RADIO/DISTORTP)
- d. The program will then start asking questions.

## 2. SYSTEM DESCRIPTION

The system consists of three subsystems

- a) Subsystem /RADIO/DISTORT
- b) Subsystem /RADIO/USA
- c) Subsystem /RADIO/DISTORTP
- d) Utility packages.

### 2.1.1 Subsystem /RADIO/DISTORT

This system consists of a series of time-sharing programs that accept the necessary input data from the terminal, process it and generate a file that will be used by the /RADIO/USA subsystem.

### 2.1.2 Subsystem /RADIO/USA

This subsystem consists of a series of batch programs that accept the output generated by /RADIO/DISTORT and carries out all the computations to provide the requested outputs. This subsystem is spawned by the time-

sharing /RADIO/DISTORT through callable routines of the utility packages.

### 2.1.3 Subsystem /RADIO/DISTORTP

This subsystem consists of a series of time-sharing programs that accept the output generated by /RADIO/USA and produces a plot on the HP 7202A graphic plotter

### 2.2 Detailed Description

Each of the subsystems contain the following functions/ subroutines.

Subsystem	Function/Subroutine
/RADIO/DISTORT	LINKMN
	LINKM1
	LINKM2
	LINKM3
/RADIO/USA	DIMXXX
	MAIN
	PATT
	FUN
	ELE
	ELK
	PXYZ
	QZP
	NPAT
	PATD
/RADIO/DISTORTP	DSTPLT
	PLOT
	LABEL

Subsystem	Function/Subroutine
Utility Packages	YSFUTL
	PACK

#### 2.2.1 Subroutine LINKMN

[1] Description: This is the resident time-sharing program that controls the link/overlays LINKM1, LINKM2, LINKM3 in and out of core. At the beginning it creates two temporary files 01 and 02. File 01 will hold the data that will be used by the subsystem /RADIO/USA. File 02 will contain the \$LIMITS and \$PRMFL statements required to run /RADIO/USA. It also attaches the file BLA00001/RADIO/NORUN that keeps track of the numbers of the executed runs (NORUN).

[2] Language: TSS FORTRAN

[3] Input: Terminal

[4] Output: Terminal

#### 2.2.2 Subroutine LINKM1

[1] Description: This time sharing program asks all the pertinent questions with regard to the calculation of antenna patterns, coupling coefficients, pattern distributions, or communication range contour. If the user responses are outside certain specified ranges, the program will print an error message and asks the question again until an acceptable response is entered.

[2] Language: TSS FORTRAN

[3] Input: Terminal

[4] Output: terminal

[5] Called by: resident subroutine LINKMN



### 2.2.3 Subroutine LINKM2

[1] Description: This time-sharing program asks questions about the site parameters and topographical data for the calculation of the communication range contours in a similar fashion as LINKM1. When all the pertinent data is entered, it prints out a summary of all the data entered in LINKM1 and LINKM2 for verification by the user.

[2] Language: TSS FORTRAN

[3] Input: Terminal

[4] Output: Terminal

[5] Called by: resident subroutine LINKMN.

### 2.2.4 Subroutine LINKM3

[1] Description: This time-sharing program, using the information of LINKM1 and LINKM2, generates the necessary data to be used by the batch programs and writes it in the temporary file 01. It also calculates the necessary size to be used in the variable dimension statements, the amount of core required, as well as an estimate of the running time. This information is printed out and is also written in the proper \$LIMITS and \$PRMFL cards of file 02. Next the file BLA00001/DISTRT/NORUN is created. This file will hold the input data for the plotter subsystem /RADIO/DISTORTP. LINKM3 then calls the CARDIN system and initiates the batch portion of the /RADIO/DISTORT subsystem through the JOB control file /RADIO/USA.RUN1

[2] Language: TSS FORTRAN

[3] Input: data generated by LINKM1 and LINKM2 through COMMON

[4] Output: Terminal Printer

Temporary Files 01 and 02

[5] Called by: resident subroutine LINKMN

#### 2.2.5 Subroutine DIMXXX

[1] Description: This batch program defines the size of the variable dimension statements of the MAIN subroutine and allocates the necessary core.

[2] Language: GMAP

[3] Input: data generated by the TSS programs

[4] Output: DIMENSION OF ARRAYS C1 and C2 of MAIN

[5] Called by: LINKM3.

#### 2.2.6 Subroutine MAIN

[1] Description: This batch program calculates all that is requested by the user. To do this, it uses a series of subroutines/ functions which are described below.

[2] Language: FORTRAN

[3] Input: Temporary file 01 and permanent file /RADIO/(filename) created by another AFCS program called SCREEN.\* (filename) was assigned to this file at the time SCREEN was run.

[4] Output: File 02 (/DISTRT/XXXX) where XXXX is a number internally generated by LINKM3 to identify the run.

[5] Called by Printer DIMXXX

\*User manual for SCREEN system (DSD M057) March 1976



#### 2.2.7 Subroutine PATT

- [1] Description: This batch program calculates the radiation patterns  
and the communication range contours
- [2] Language: FORTRAN
- [3] Input: /RADIO/(filename)  
COMMON and arguments from MAIN
- [4] Output: File 02 (/DISTORT/XXXX) and the printer  
Argument-AMAX  
COMMON - AZ
- [5] Called by MAIN

#### 2.2.8 Subroutine FUN

- [1] Description: This batch program performs numerical integration  
by the trapezoidal rule.
- [2] Language: FORTRAN
- [3] Input Arguments: DD, DE, Y9, NDIM
- [4] Output Argument: SUM
- [5] Called by: MAIN

#### 2.2.9 Function ELE

- [1] Description: This batch program performs the numerical integra-  
tion of elliptic integrals of the second kind.
- [2] Language: FORTRAN
- [3] Input Argument: P
- [4] Output: Return value to MAIN
- [5] Called by: MAIN

#### 2.2.10 Function ELK

- [1] Description: This batch program performs the numerical integration of elliptic integrals of the first kind.
- [2] Language: FORTRAN
- [3] Input Argument: P
- [4] Output: return value to MAIN
- [5] Called by: MAIN

#### 2.2.11 Subroutine PXYZ

- [1] Description: In order to perform all desired calculations every antenna has to be subdivided into small subsections. This program computes the coordinates of the end points of each of test subsections.
- [2] Language: FORTRAN
- [3] Input: Temporary file 01  
COMMON
- [4] Output: COMMON (IT, X, Y, Z, X1, Y1, Z1)
- [5] Called by MAIN

#### 2.2.12 Subroutine QZP

- [1] Description: This batch program calculates the redundant elements of the impedance matrix.
- [2] Language: FORTRAN
- [3] Input: Arguments  
COMMON
- [4] Output: Argument MZ

[5] Called by: MAIN

2.2.13 Subroutine NPAT

[1] Description: This batch program normalizes the radiation pattern to its maximum value.

[2] Language: FORTRAN

[3] Input: Arguments AINT, AZ, AMAX, AIT

COMMON

[4] Output: File 02 (/DISTRT/XXXX)

Arguments: ATH, FM, FDB, I

[5] Called by: MAIN

2.2.14 Subroutine PATD

[1] Description: This batch program calculates the pattern distribution of normalized horizontal patterns.

[2] Language: FORTRAN

[3] Input Arguments: DPER, IDB, NFD, AZ

[4] Output: File 02 (/DISTRT/XXXX)

Arguments: P,G, or P, G, H or P, H

[5] Called by MAIN

2.2.15 Subroutine DSTPLT

[1] Description: This time-sharing program was developed by AFCS personnel. It controls the HP7202A graphic plotter and produces a plot of the horizontal and vertical patterns calculated by the subsystem /RADIO/DISTORT

- [2] Language: FORTRAN
- [3] Input: File (DISTRT/XXXX)
- [4] Output: Plotter (HP 7202A graphic plotter)
- Terminal
- [5] Called by: /RADIO/DISTORTP subsystem

#### 2.2.16 Subroutine PPLOT

- [1] Description: This time-sharing program was developed by AFCS personnel. It calculates the (X,Y) coordinates of the points to be plotted.
- [2] Language: FORTRAN
- [3] Input: Arguments
- [4] Output: Plotter (HP 7202A graphic plotter)
- Terminal
- [5] Called by: DSTPLT

#### 2.2.17 Subroutine LABEL

- [1] Description: This time-sharing program was developed by AFCS personnel. Its function is to generate alphanumerics on HP 7202A graphic plotter.
- [2] Language: FORTRAN
- [3] Input: Argument INPTFILE
- COMMON
- [4] Output: Plotter (HP 7202A graphic plotter)
- [5] Called by: DSTPLT



#### 2.2.18 Utility Package YSFUTL

[1] Description: This utility package was developed by AFCE personnel and is designed to be used as a subroutine for TSS FORTRAN programs. It performs miscellaneous worthwhile functions which are difficult or impossible to pull off without the aid of such a subroutine. There are eight entry points to this routine, the characteristics of which are described below.

a) Call FLGBRK (FLAG)

Where FLAG is a logical variable, will allow recovery from breaks during execution. When FLGBRK is called, FLAG will be set to the logical value FALSE. If a break occurs subsequently, the logical variable FLAG will be set to TRUE to indicate recognition of a break. This FLAG may be tested by the calling routine at any time, and any appropriate action taken. To protect the user against infinite loops, however, breaks are counted as they are received; if twenty or more breaks are recognized, execution is temporarily suspended and the following message appears --

\*BREAK STOP OR CONTINUE

At this point the user may enter any of three responses:

- S will immediately terminate the program
- A will terminate the program with a DRL ABORT
- C will reset counters and continue execution

Note: The DRL report allows dumping the subsystem to a file for debugging purposes.

b) Call BRKOFF

Calling this entry point nullifies the effects of a previous call to FLGBRK.

c) Call KEYOT

Calling this entry point will force any output accumulated by the subsystem to be output. This is of significance whenever small amounts of output are being generated, with extended processing intervening. If this function is not used, in such a case the output will not be printed until the executive's buffer fills, or input is requested, either of which might not occur for a long time.

d) Call KEYIN (BUFFIN)

This entry point allows the user to retrieve the last line of input so long as it remains available. Thus it effectively functions as a back-space command for the teletype. The input is placed in the Array, BUFF, in 21A4 format. N is an integer variable into which will be placed the number of characters transmitted. Note that N may be zero, indicating that the data is no longer available due to intervening output. The data placed in BUFF is not edited or blank filled in any way, and will include a carriage return character at the end of the line. N includes the carriage return.

e) Call CALLTS (SSNAME, LINE, NCHAR)

This entry point allows the user to place data in the KIN buffer or call another TSS subsystem or both. If a subsystem is to be called,

the first four characters of the subsystem name should be placed in the ASCII variable SSNAME. If SSNAME contains all blanks or is an integer zero, the subsystem call will be bypassed. If data is to be placed in the KIN buffer, the count of characters to be moved should be placed in the integer variable NCHAR and the ASCII array, LINE should contain the data to be placed in the buffer in 21A4 format. Up to 81 characters may be placed in the buffer in this manner. If NCHAR is zero, this function will be bypassed. As an example of usage of this function, assume the user wishes to obtain the status of a batch job with the SNUMB 1234T. The command at system level would be: JSTS 1234T<CR>. This may be accomplished by the TSS FORTRAN program by placing the subsystem name (JSTS) in SSNAME. Placing the command(JSTS 1234T<CR>) in line and the character count (11) in NCHAR. The JSTS subsystem is then called to produce the job status message.

f) Call ULASCI (ARRAY,CPOS,NCHAR,L)

This entry point is used to force ASCII data in an array to upper case or lower case ASCII code. This is occasionally useful, inasmuch as most teletypes transmit only upper case, and certain pieces of software (TSS FORTRAN, for example) recognize only upper case ASCII, whereas lower case is somewhat easier to work with and hence is required by other timesharing software. ULASCI will transliterate either way. The data in the ASCII array, ARRAY, is acted upon, starting at character position CPOS (INTEGER) with NCHAR characters. If L is



even, the data will be forced upper case; if L is odd, it will be forced lower case. Note: The character position, CPOS is handled in the same way as in the standard TSS subroutines, Get #C, Put #C and Move #S.

- g) Call BCDASC (FROM, IPOS, TO, JPOS,NCHAR,FILL)
- h) Call ASCBCD (FROM, IPOS, TO, JPOS,NCHAR,FILL)

These two routines function as a move #S with transliteration as indicated. IPOS and JPOS are starting character positions in FROM and TO, respectively. Bear in mind that there are 4 ASCII characters per word, and 6 BCD characters per word. FILL is a blank fill control. If the integer variable fill is zero, the array, TO, is not blank-filled. If FILL is nonzero, the last receiving word of the array will be blank-filled.

- [2] Language: GMAP
- [3] Input: Arguments
- [4] Output: Return Arguments
- [5] Called by: LINKM3, DSTPLT

#### 2.2.19 Utility Package PACK

- [1] Description: This utility package was developed by AFCS personnel to manipulate character strings. It contains three entry points UNPACK, PACK, and MOVE which are described below.

UNPACK is used to convert a packed character string, in either BCD or ASCII, into an unpacked character string (one character per word,



left justified, with trailing blanks in each word) of the same mode (BCD or ASCII). The calling sequence is:

CALL UNPACK(LINE,I,ARRAY,J,N)

where LINE is the packed character string, and ARRAY is the unpacked character string. N characters are moved, starting with the Ith character of LINE and the Jth character of ARRAY. The mode of the character strings is assumed to be ASCII; this may be altered as follows:

CALL UNPACK( ,0)      changes the mode to BCD

CALL UNPACK( ,1)      changes the mode back to ASCII.

PACK has the opposite effect of UNPACK; it moves characters from the first to third arguments, packing them as it goes. MOVE moves a packed string from the first to third arguments. PACK and MOVE each have a sixth argument which, if nonzero, causes the last word into which data was moved to be filled with blanks to the end of the word. Calling PACK or MOVE with a null first argument will set the mode (BCD or ASCII) as above; the mode currently in effect applies to all three entry points.

- [2] Language: GMAP
- [3] Input: Arguments
- [4] Output: As described above
- [5] Called by: DSTPLT

### 3. INPUT/OUTPUT FILES DESCRIPTION

#### 3.1 General Description

In order to communicate among the various systems used here, a series of temporary and permanent files have to be created. A list of

these files with a description of their purpose follows:

### 3.1.1 List of Files

The list of the files is presented in the order they are created or used.

03 / RADIO/NORUN	Permanent file where the numbers of the different runs are stored for reference with the output data and plots attached by LINKMN
01	Temporary file created by LINKMN to save all the data computed by /RADIO/DISTORT time-sharing subsystem to be used by the batch /RADIO/USA subsystem.
02	Temporary file created by LINKMN where the \$LIMITS and \$PRMFL cards required by /RADIO/USA are stored. These statements are written by LINKM3.
DISTR/XXXX	Permanent file created by LINKM3 that will be used by /RADIO/USA as its output file. XXXX is the number of the run stored in /DISTR/NORUN.
/RADIO/USA.RUN1	Permanent file containing all the necessary job stream cards and files to run /RADIO/USA
/RADIO/IDENT	Permanent file that has the \$IDENT card. The reason for this is so that it can be altered by different users.
RADIO/(filename)	Permanent file created by the AFCS system SCREEN where all the pertinent topographical data of a

site designated by (filename) is stored. This site is used by RADIO/USA to calculate communication range contours.

### 3.1.2 Detailed File Description

#### 3.1.2.1 File 03 /RADIO/NORUN

[1] File Content: This file contains the numbers assigned to the different runs for identification purposes.

[2] Written by: LINKM3

[3] Read by: LINKM3

[4] File Type: Sequential

[5] File Mode: Binary

\$:PRMFL:03,W/R,R, BLA00001/RADIO/(filename)

[2] Written by: LINKM3

[3] Read by: /RADIO/USA.RUN1

[4] File Type: Sequential

[5] File Mode: ASCII

#### 3.1.2.2 File 01

[1] File Content: This file contains the output of the /RADIO/DISTORT time-sharing system.

[2] Written by: LINKM3

[3] Read by: /RADIO/USA

[4] File Type: Sequential

[5] File Mode: ASCII

### 3.1.2.3 File 02

- [1] File Content: This file contains the \$LIMITS and \$PRMFL cards necessary to run /RADIO/USA. It can have at most the following
- \$:LIMITS:XX,XXXX, 10K
- \$:PRMFL:02,W,S,BLA00001/DISTR/XXXX

### 3.1.2.4 File / DISTR/XXXX

- [1] File Content: This file contains the output of the batch /RADIO/USA subsystem to be used by the /RADIO/DISTORTP subsystem.
- [2] Written by: MAIN, PATT, NPAT, PATD
- [3] Read by: DSTPLT
- [4] File Type: Sequential
- [5] File Mode: Binary
- [6] Record Length: Variable
- [7] Record Format:

Record Type	DATA
1	ANT#(FED),FREQ(MHZ)
2	EMAX,GAIN,GAIN(DB)
3	THETA or PHI, NMAG,NMAG(dB)
4	PHI (vertical pat.)
5	THETA (horizontal pat.)

### 3.1.2.5 File / RADIO/USA.RUN1

- [1] File Contents: This file contains the necessary JCL to run /RADIO/USA. A listing of this file looks like



SYSTEM ?LIST /RADIO/USA.RUN1

```
#ASIS N
$ SELECTA BLA00001/RADIO/IDENT
$ OPTION FORTRAN

$ LIBRARY LB
$ USE .....
$ ENTRY .....
$ EXECUTE DUMP
$ SELECTA 02

$ DATA 01
$ SELECTA 01
$ PRMFL LB,R,R,BLA00001/RADIO/USA
$ ENDJOB
```

[2] Written by: Created by the user

[3] Read by: LINKM3

[4] File Type: Sequential

[5] File Mode: ASCII

#### 3.1.2.6 File /RADIO/IDENT

[1] File Content: This file contains the \$IDENT card to allow different users to modify it easily:

```
$ IDENT BLA00001,PERINI-SW,956700160121,DISTORT
```

[2] Written by: Created by the user

[3] Read by: /RADIO/USA.RUN1

[4] File Type: Sequential

[5] File Mode: ASCII

#### 3.1.2.7 File RADIO/(filename)

[1] File Content: This file contains the topographical data of

the site identified by (filename). This file is created by the AFCS system SCREEN.

[2] Written by: SCREEN System (AFCS)

[3] Read by: PATT

[4] File Type: Random

[5] File Mode: Binary

[6] Record Length: 9 words

[7] Record Format:

Field Name	Content Description
ZZ	Azimuth in radians
ELANG	Elevation Angle in radians
DIST	Distance to screen in feet
RNG(1)	Ranges in nautical miles
:	
:	
:	
RNG(6)	

#### 4. PROGRAM ASSEMBLING, LOADING, AND MAINTENANCE PROCEDURES

##### 4.1 Source Program Storage

The source programs are stored in the file RADIO/RADAR and also on magnetic tape.

##### 4.2 System and Subsystem Creation

This is done under the FILE EDIT system. All the necessary cards are stored in the file /RADIO/JOB. A list with explanation follows.

#### 4.2.1 List of /RADIO/JOB

```

10$ IDENT BLA00001,PRINI-SW,956700160121,RADIO-JOB
20$ FILEDIT SOURCE,NOBJECT,UPDATE
30$ LIMITS 1,,,9K
40$ PRMFL H*,R,S,BLA00001/RADIO/RADAR
50$ FILE K*,D1SR,6L
60$ DATA *C,,COPY
70$ MODIFY SOURCE,,DSTRTP
80$ FORTRAN ASCII,NFORM,NLNO,OPTZ DSTRTF
90$ UPDATE LIST
100$ ALTER 1
110 SUBROUTINE DSTPLT
120$ ENDEDIT
130$ ENDCOPY
140$ FILEDIT SOURCE,OBJECT,INITIALIZE,NONE
150$ LIMITS 5,,,9K
160$ FILE *C,D1R
170$ FILE K*,NULL
180$ FILE R*,D2SR,5L
190$ FILE P*,NULL
200$ SYSOUT *5
210$ PROGRAM RANLIB
220$ LIMITS 1,,,9K
230$ FILE R*,D2SR
240$ FILE A4,D3SR,10R
250$ RFLCON 40
260$ OPTION FORTRAN,NOFCB,NOGO,SAVE/.....
270$ LIBRARY LB
280$ USE LINKMN
290$ USE .GTLIT,.TSGF...FTSU...FXEHA
300$ ENTRY LINKMN
310$ EXECUTE DUMP
320$ LIMITS 1.20K..9K
330$ FILE LB,D3SR
340$ PRMFL H*,R/W,R,BLA00001/RADIO/DISTORT
350$ OPTION FORTRAN,NOFCB,NOGO,SAVE/.....
360$ LIBRARY LB
370$ USE DSTPLT
380$ USE .GTLIT,.TSGF...FTSU...FXEHA
390$ ENTRY DSTPLT
400$ EXECUTE DUMP
410$ LIMITS 1.15K,,9K
420$ FILE LB,D3R
430$ PRMFL H*,R/W,R,BLA00001/RADIO/DISTORTF
440$ BREAK
450$ FILEDIT NOSOURCE,OBJECT,NONE
460$ LIMITS 1,,,9K
470$ FILE *R,D2R
480$ FILE R*,D4SR,5L
490$ DATA *C,,COPY
500$ DELETE ,,PACK
510$ ENDEDIT
520$ ENDCOPY
530$ PROGRAM RANLIB
540$ LIMITS 1,,,9K
550$ FILE R*,D4R
560$ PRMFL A4,R/W,R,BLA00001/RADIO/USA
570$ ENDJOB

```



#### 4.2.2 Explanation of /RADIO/JOB

The file BLA00001/RADIO/JOB contains all of the programs that were on tape we sent you, and they are in the same format as on the tape. The first activity, a FILEDIT, merely modifies the main plotting routine, DST RTP. A SUBROUTINE DSTPLT statement is added to change the SYMDEF of the routine from ..... to DSTPLT so that all of the routines will have unique SYMDEFs. Without the change, there would be two routines (DST RTP and DIMXXX) with the same SYMDEF (.....), and since programs which have been placed on a random library by the program RANLIB are accessed by SYMDEF, the second of the two would then be inaccessible.

The second activity, another FILEDIT, compiles or assembles all of the programs and places the object decks on a single output file, R\*. This file is used as input to the third activity, RANLIB, where the object decks are reformatted and placed on a random library file.

The fourth activity loads the timesharing input programs and saves the core image of these programs onto an H\* file. The \$ RELCOM card is required since the programs are highloaded, causing the COMMON to be allocated in low core. Without the \$RELCOM, COMMON allocation would begin at 100 octal, just above the slave prefix. This is correct for a batch program; timesharing, however, requires a larger slave previx (144 octal instead of 100 octal words), so COMMON must be relocated above timesharing's slave prefix. This is not required in the fifth activity, since there is no blank common. The name following the SAVE option of the \$OPTION card is arbitrary, since there is only a single core image saved on the file, and it is not used as an overlay nor accessed by a MME GECALL/GERSTR or



DRL RESTOR. The \$ USE and \$ ENTRY cards are used to inform the loader that the program whose SYMDEF is LINKMN is to be loaded (in this case from the random library created in the previous activity), and that execution is to begin with this program (later on, in timesharing, when the program is actually executed). The other \$ USE card forces loading of special versions of several FORTRAN library routines which replace the BCD- and batch-oriented routines and allow executing in an ASCII time-sharing environment. The fifth activity is similar to the fourth, except that the timesharing output/plotting routines are being loaded and saved. The sixth and seventh activities delete the timesharing programs from the collection of object decks produced in activity 2, leaving only the batch object decks. These are then placed on a random library file for later execution.

The procedure described above, using FILEEDIT and RANLIB, was used in our current implementation of the DISTORT system; however, you should be aware that many variations of this procedure are possible.

#### 4.2.3 Program operation

The file BLA00001/RADIO/NORUN is a binary file containing a single work of binary information, along with the three words of standard GFRC control information. This single word is a binary integer; it is read, incremented, and written back in lines 7790 thru 7840 of LNK3A. It is used thereafter in LNK3A to specify a unique file name. This file is created and erased, deaccessed, specified for file code 02 in the spawned batch job, used by a batch job to contain output to be passed to the plot routines, read and released by the plot routines, and lastly, the file name is printed out as a "program execution number" to allow the user to keep track of the

input and output for each execution of the program.

File 01 in the timesharing input program contains the data specifying the problem; file 02 contains the \$ LIMITS card specifying the appropriate output files for the batch job. The amount of core required for a given execution of the batch program is calculated on line 7700 of LNK3A; this statement allows approximately 27K words for the program and file buffers, and an additional 1K for each 1K or fraction thereof required for the two variable arrays, C1 and C2. The amount of time required is calculated on line 7710; it is arbitrarily set at 50/100 hour, since we are not aware of an algorithm by which a better estimate of the time required can be calculated.

REWIND and FCLOSE are used on files 01 and 02 in line 8040 of LNK3A, since the buffers for these two files must be completed and written out to the files prior to calling the CARDIN subsystem. The subroutine CALLTS (part of YSFUTL) is called to invoke the ACCESS, REMOVE, and CARDIN subsystems of timesharing to create, erase, and deaccess a permanent file, and to spawn a batch job.

CALLTS is one of several FORTRAN-callable entry points within the YSFUTL utility package. Nearly all of the code pertinent to its operation is on the listing of YSFUTL. Its operation involves two steps. The first step, lines 15020 thru 15230 is to perform a DRL PSEUDO, which simulates input from the keyboard. Keyboard input is simulated because the subsystem which is subsequently called will frequently examine the last line of input typed in at the keyboard to determine the exact nature of the function to be performed. The second step of the procedure, lines 15240 thru 15380, is to

invoke the desired subsystem via DRL CALLSS. When this DRL is executed, the program that executed the instruction is interrupted, its state is automatically saved by the TSS Executive, and the specified subsystem is loaded and executed. After the subsystem has terminated, the program which executed the DRL CALLSS is reinstated and its execution resumed at the point where it was interrupted.

UNPACK is one of the FORTRAN-callable entry points within the PACK utility package. UNPACK is used to convert a packed character string, in either BCD or ASCII, into an unpacked character string (one character per word, left justified, with trailing blanks in each word) of the same mode (BCD or ASCII). The calling sequence is:

CALL UNPACK (LINE,I,ARRAY,J,N)

where LINE is the packed character string, and ARRAY is the unpacked character string. N characters are moved, starting with the Ith character of LINE and the Jth character of ARRAY. The mode of the character strings is assumed to be ASCII; this may be altered as follows:

CALL UNPACK (,0)      changes the mode to BCD

CALL UNPACK (,1)      changes the mode back to ASCII.

PACK has the opposite effect of UNPACK; it moves characters from the first to third arguments, packing them as it goes. MOVE moves a packed string from the first to third arguments. PACK and MOVE each have a sixth argument which, if nonzero, causes the last word into which data was moved to be filled with blanks to the end of the word. Calling PACK or MOVE with a null first argument will set the mode (BCD or ASCII) as above; the mode currently in effect applies to all three entry points.



DIMXXX automatically allocates storage for the two arrays, C1 and C2, depending upon the amount of storage available to be allocated to these two arrays, which is in turn dependent upon the \$ LIMITS card generated by LNK3A when the batch job was spawned. When the batch program is loaded for execution, the instructions are loaded at the high end of the memory segment allocated by the \$ LIMITS card. As a result, "unused" space may exist near the low end of memory. DIMXXX calls .FOPEN to allocate I/O buffers for files 01, 02, and 06, since these buffers are taken from this "unused" space. The amount of "unused" space remaining is then calculated, and the maximum dimension for C1 and C2 which will fit into the remaining space is computed. A MME GESNAP instruction is executed to document the locations and dimensions of C1 and C2, and this information is then passed to the main batch routines via a CALL statement and adjustable dimension procedures.

The batch FORTRAN routines were modified wherever a WRITE to file code 02 appeared. In some cases, such as the coupling coefficient printouts (which are not plotted) and where the printout is purely textual with no variable information, the WRITE statements were deleted altogether (converted to COMMENTS). In the other cases the original WRITE statement was converted to a COMMENT and a new BINARY (unformatted) WRITE statement was inserted in its place. These new statements convey the same variable information as the original (unformatted) WRITE statements, with the addition of RECORD TYPE and RECORD LENGTH variables at the beginning of each record, and without the textual information. These changes have resulted in a somewhat reduced filespace requirement for the output file (150 words versus 198 words, or a 25% reduction, for the sample run included in this

package; in general, the reduction is on the order of 13%). More importantly, though, the file is more readily machine-readable than it was before. The record can be read at once with a single binary read statement; no format conversion is required; the exact nature and amount of data read is immediately available to the plotting program, without having to go through the trial-and-error series of IF and DECODE statements required to interpret the formatted output.

The plotting routines (DSTRTP, DSTRP1, and Y.LABL, with utility routines YSFUTL and PACK) allow the user to plot the antenna patterns generated by a given execution of the batch portion of the DISTORT system. DSTRTP first requests the "program execution number" which is the name of the file to be plotted; the file is accessed and an initial scan of the data on the file is made, tabulating gain figures and printing out a summary of the data on the file. The user is then asked a series of questions to determine which portion of the data on the file is to be plotted and the way in which the user desires to have the data presented. After this information has been obtained, the plotter is activated and the plot produced. Upon completion of the plot, the user is given several options to either rerun a portion of the plotting program or release the data file if it is no longer needed.

The user is given the option of plotting the vertical or horizontal patterns for a given run, or both may be plotted on the same graph. The user may also plot an isotropic circle if he so desires. The plot may be presented in any one of three different ways: scaled, normalized or family. If "normalized" is selected, the horizontal and/or vertical plots will (both) be normalized, i.e. will extend to the usable limits of the graph paper at

the points of maximum gain. The size of the isotropic circle will then be scaled to indicate the relative magnitudes of the isotropic and the pattern plotted. Since only one isotropic circle is plotted, the user will be asked which pattern the circle is to be related to in the event that both the horizontal and vertical patterns are being plotted in normalized form. If "scaled" is selected, the horizontal, vertical, and isotropic patterns for the run to be plotted will all be scaled relative to each other so that their relative magnitudes can be readily seen. Finally, if "family" is selected all runs for this file will be scaled relative to each other. This allows the user to see how the gain, as well as the shape of the pattern, varies from run to run as the frequency is changed.

After the appropriate scaling factors have been computed, the user is given an opportunity to ready the plotter for operation; plotting then begins. The data points to be plotted are read by DSTRTP; the scaling and output of the data to the plotter for both patterns and the isotropic circle is done by DSTRP1, which is called once for each data point to be plotted. Only a few points on the isotropic circle are plotted; these appear as dots at 45 degree intervals. If the user requested that the program stop between plots, the message CHANGE PENS will appear between each pattern, affording the user an opportunity to change the color of the pen before continuing. Lastly, Y.LABL is called to place the program execution number and run number in the upper lefthand corner of the plot. The user may then plot another run from the same file, or he may release the file if no longer needed and then begin plotting from another file or terminate the plotting program.



Y.LABL produces alphanumeric characters on the plotter. It is capable of producing any of the 95 printable ASCII characters, although in this application it produces only numerics and the hyphen. It can get its data from labeled common, as it does in this case, or from the keyboard or from a disk file containing the answers that would be typed at the keyboard. It is capable of many variations in scaling. A file called BLA00001/PLOTTER/ALPHANUM, a random data file, contains descriptions of the shapes of the characters to be plotted. You do not have a copy of the data in this file, and it would be somewhat difficult for you to duplicate its contents; this is of little consequence, however, since you also do not have a plotter to use the data and since the program, when it is unable to access the file, will simply print an error message to that effect and return.

#### 4.2.4 HP 7202A graphic plotter

The graphic plotter produces graphs by drawing straight line segments between successive coordinates or by plotting points at the coordinates. Every point is uniquely defined by a 4 digit X and a 4 digit Y coordinate pair. Each coordinate may range from 0000 to 9999. Line segments may be up to 3 inches in length; coordinates are accepted at a maximum rate of 1.1 coordinate pairs per second. Since data is transmitted from the computer at 30 characters per second, this last requirement necessitates adding "fill" characters to take up additional time. If each plotter command or coordinate pair is preceded by about 10 blanks, the combined delay of the blanks, the data itself, and the several nonprinting character inserted in each line by timesharing should be sufficient.

The plotter is manually adjusted so that position 0.0 corresponds

to the lower left corner of the usable space on the graph paper; it is then manually adjusted so that 9999,9999 corresponds to the upper right corner. Thus, any coordinate pair sent to the plotter will cause the pen to move to a corresponding point on the grid area of the graph paper.

When the plotter is turned on, receipt of the characters PLTL enables the plotter; line segments will be drawn between the coordinates transmitted on lines following this command. PLTP causes the points to be plotted; the pen will move to the specified coordinates, make a dot on the paper, and then lift from the paper before moving to the next coordinate. PLTT terminates plotting and disables the plotter. The carriage return character causes the pen to move to a new position, and the line feed character prepares the plotter's logic to accept the next pair of coordinates. The up-arrow or circumflex character immediately following the Y coordinate in line mode causes the pen to lift prior to moving to that position. This allows pen lift while plotting lines with PLTL. A typical line containing coordinate information will begin with 10 spaces, followed by a 4 digit X coordinate, followed by one space, followed by a 4 digit Y coordinate, followed by a carriage return and line feed.

#### 4.2.5 Sample Timesharing Runs

The \$ IDENT card image is contained on a file separate from the rest of the JCL for the batch portion of DISTORT, so that the \$ IDENT card can readily be altered as needed by using personnel, without disturbing the rest of the JCL. The \$ IDENT card image is inserted into the JCL stream by CARDIN in response to the \$ SELECTA card image. The \$ LIBRARY, \$ USE, \$ ENTRY, and \$ PRMFL cards allow the loader to load and execute the batch

DISTORT program from the random library file on which the program resides. Note that the batch program must be reloaded each time it is to be used, since varying memory size allocations dictate loading the program at different locations in memory and making corresponding changes to constants used by FORTRAN's library routines, a task accomplished by the loader. This is in contrast with the timesharing segments of the system, whose memory allocation sizes do not vary from one execution to the next and which, therefore, can be loaded once by the loader; thereafter they are simply recalled from the H\* file and executed, without going through the usual loading procedure. The two \$ SELECTA cards following the \$ EXECUTE cause CARDIN to include the \$ LIMITS and \$ PRMFL 02 card images and the data card images in the JCL stream.

The file NORUN is a binary data file. Since it is binary, it cannot be listed by the LIST subsystem of timesharing; instead, the FDUMP subsystem is used to display the contents of the file in octal. Only one word underlined is used for the data; it is a binary integer with the decimal value 1030. The other three words are system standard format GFRC control words.

The timesharing input program is invoked by the command loader when the user types the file descriptor of the H\* file containing this program. The program executes, and after all data has been input and printed out for verification, the user is informed of the program execution number (derived by incrementing the binary integer on file NORUN) and the limits required for the job. If the data is correct a file is created (using the program execution number as a file name) and CARDIN is called to spawn the job.



Upon completion of the batch job the plotting routines are similarly invoked using the command loader.

A list of a sample run follows.

#### 4.2.6 List of Sample Timesharing Runs

```
SYSTEM ?LIST /RADIO/USA.RUNI
```

```
##ASIS N
$ SELECTA BLA00001/RADIO/IDENT
$ OPTION FORTRAN
$ LIBRARY LB
$ USE .....
$ ENTRY .....
$ EXECUTE DUMP
$ SELECTA 02
$ DATA 01
$ SELECTA 01
$ PRMFL LB,R,R,BLA00001/RADIO/USA
$ ENDJOB
```

READY

```
SYSTEM ?FDUM /RADIO/NORUN
```

BLOCK TO BE READ? 1

FUNCTION ? 50,4

000000 000001000003 000001000103 000000002006 000000170000

0

```
SYSTEM ?REMO CLEARFILES
```

```
SYSTEM ?FORT NEW
```

READY

```
*RUN AFCS.LIB/RADIO/DISTCRT
```

DIMENSIONS IN METERS OR INCHES ?

=M

GROUND PLANE ?

=N

SIMPLE PROG ?

=Y

COUPLING COEFFICIENTS ?

=N

NUMBER OF ANTENNAS

=

1

\*\*\* ANTENNA NUMBER 1 \*\*\*

ANTENNA TYPE ? (1097, 197, 1181 OR 1000)

=197

ANTENNA POSITION X,Y,Z ON THE PLATFORM

=0..0..0.

+++ RADIATION PATTERN +++

VERTICAL PATTERN ?

=Y

PHI (DEGREES)

=0.

PLOTTING INCREMENT (NON-ZERO NUMBER) (DEGREES)

=10

HORIZONTAL PATTERN ?

=

N

COMMUNICATION RANGE CONTOUR ?

=N

NUMBER OF RUNS

=1

\*\*\*\* RUN # 1 \*\*\*\*

FREQUENCY (MHZ)

=320.

FED ANTENNA (#)

=1

DIM= M GP= N SIMP= Y COUPL= N NR= 1

ANT# = 1

TYPE = 197

X = 0.

Y = 0.

Z = 0.

VER PAT= Y

PHI = 0. PLOT INC= 10.00

HOR PAT= N

COM RNG= N

RUN# FREQ(MHZ) ANT FED(#)

1 320.00 1

DATA CORRECT ?

=Y

PROGRAM EXECUTION NUMBER-1031

ARRAY DIMENSIONS = 7

JOB REQUIRES 50/100 HR TIME AND 028K WORDS CORE.

SNUMB # 3168T

FERUN?

=N

SYSTEM ?STAT

CHANNEL 4200

USER STATUS ON MAR 16, 1978 AT 15:50:35 LOG-ON AT 15:30:40

PROC TIME USED 2.54 SEC., 60 FILE I/O 6400 CHAR KEY I/O

LIST OF OPEN FILES: 01 02 USA.RUN1

SYSTEM ?LIST 01;02

```

1 26 1 0 0. 0.
0.480 0.030 0.450 0.450 0.450 0.450 0.450 0.450 0.450
0.450 0.450 0.450 0.450 0.450 0.170 0.170 0.170 0.170
0.170 0.170 0.170 0.170 0.170 0.170 0.170 0.170 0.170
0.01750 0.00200 0.00450 0.00450 0.00450 0.00450 0.00450 0.00450 0.00450
0.00450 0.00450 0.00450 0.00450 0.00450 0.00450 0.00350 0.00350

0.00350 0.00350 0.00350 0.00350 0.00350 0.00350 0.00350 0.00350

0.00350 0.00350
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0.480 0.480 0.480 0.480 0.480 0.480 0.480 0.480
0.480 0.480 0.480 0.480 0.480 0.510 0.510 0.510 0.510
0.510 0.510 0.510 0.510 0.510 0.510 0.510 0.510
1 0 0 0 0. 0. 10.00 0. 0.
197
7 0 1 0 0 320.00
0. 1.000 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
2 1 3 3 3 3 3 3 3 3 3 3 3 3 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 3 4 4 4 4 4 4 4 4 4 4 4 4 7 7
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
1 3 4 4 4 4 4 4 4 4 4 4 4 4 7 7
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7

```

\$:LIMITS:50,028K,,20K

\$:PRMFL:02,W,S,AFCS-LIB/DISTR/1031

READY

SYSTEM ?CATA DISTR

LIST OF CATALOG-DISTR  
CATALOGS  
FILES

1031

SYSTEM ?FDUM /RADIO/NORUN

BLOCK TO BE READ? 1

FUNCTION ? 50,4

000000 000001000003 000001000103 000000002007 000000170000

2



#### 4.3 Program Changes Procedures

As stated in 4.1 all programs are stored in source format in the RADAR file. Therefore, they can be changed by the normal procedures available to any TSS user. If new programs/subroutines/functions are written, they should be merged in the file RADAR with the proper \$ (System) card for compilation. The File EDIT system as listed in /RADIO/JOB can then be rerun, updating all subsystems.

#### 4.4 Program Verification

Even if the program has been modified, it should still produce the same results as previous runs (see User's Manual) that are not affected by the changes. Programmers should provide test runs to verify that modifications are working properly.

#### 4.5 Error Conditions

There are two types of error conditions: system errors and user's errors.

##### 4.5.1 System Errors

These are due to improper use of the computer system and are listed in the appropriate manuals.

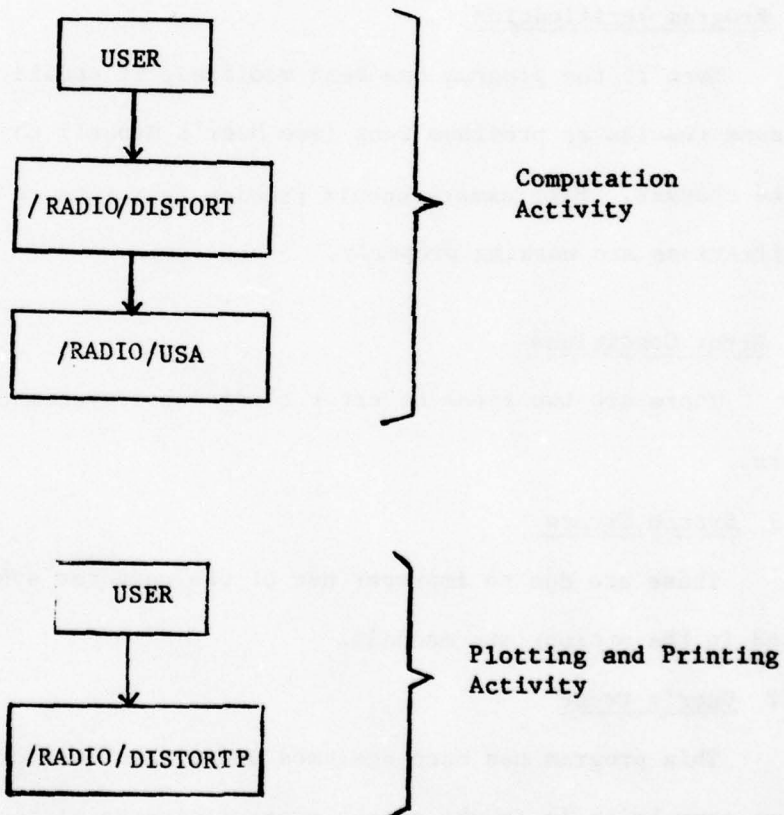
##### 4.5.2 User's Error

This program has been designed under the "user oriented" philosophy. It has many built in checks on the appropriateness of the answers. For example, if the user tries to feed a VHF antenna with a UHF frequency, the program will detect the error and request the frequency again (see User's Manual). Of course, if the wrong VHF frequency is entered, the program will accept it, since it is a valid frequency for the VHF antenna.

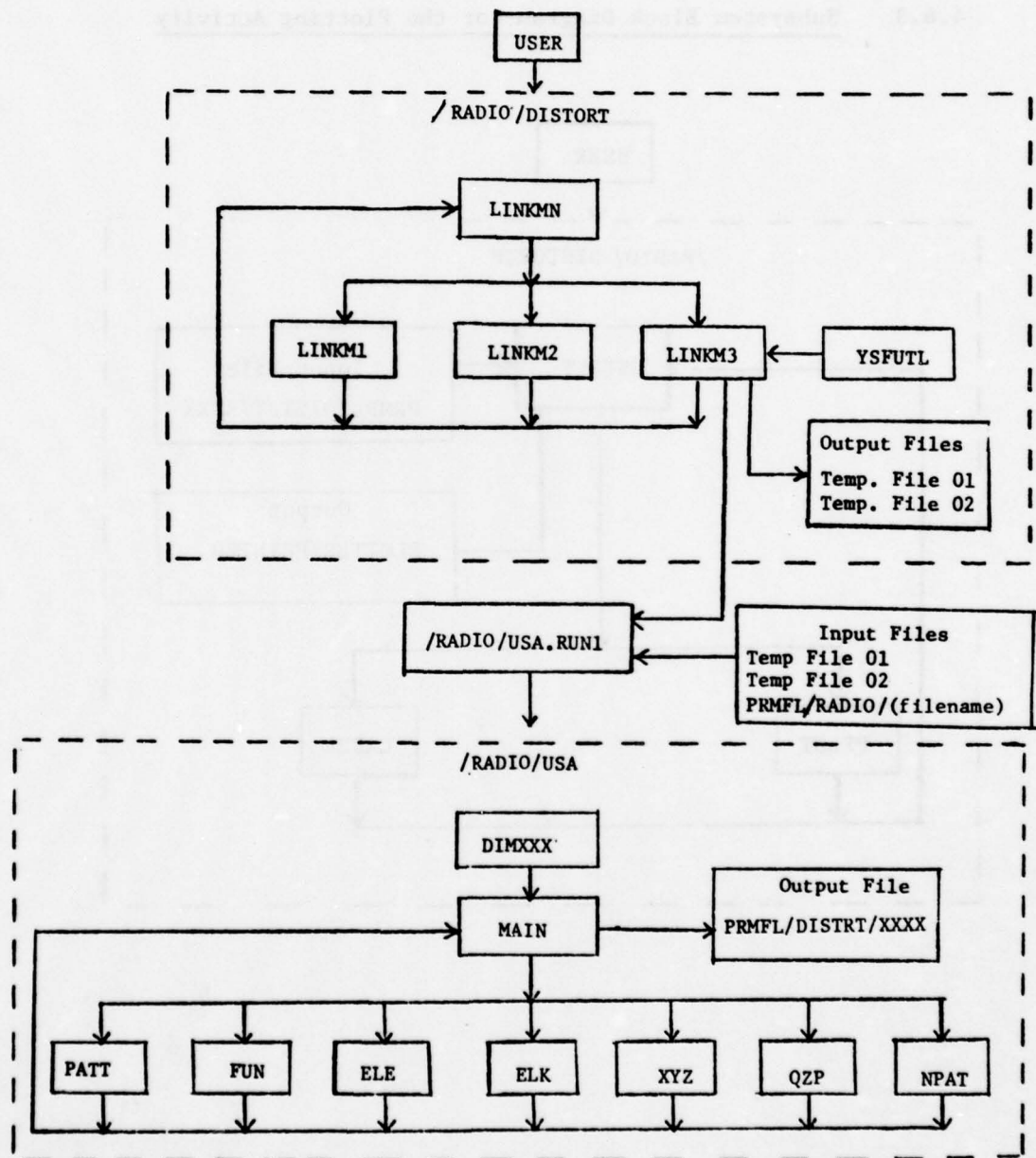
#### 4.6 Flow Charts/Block Diagrams

In the next sections flow charts/block diagrams for the overall system and for each program are presented.

##### 4.6.1 Overall System Block Diagram

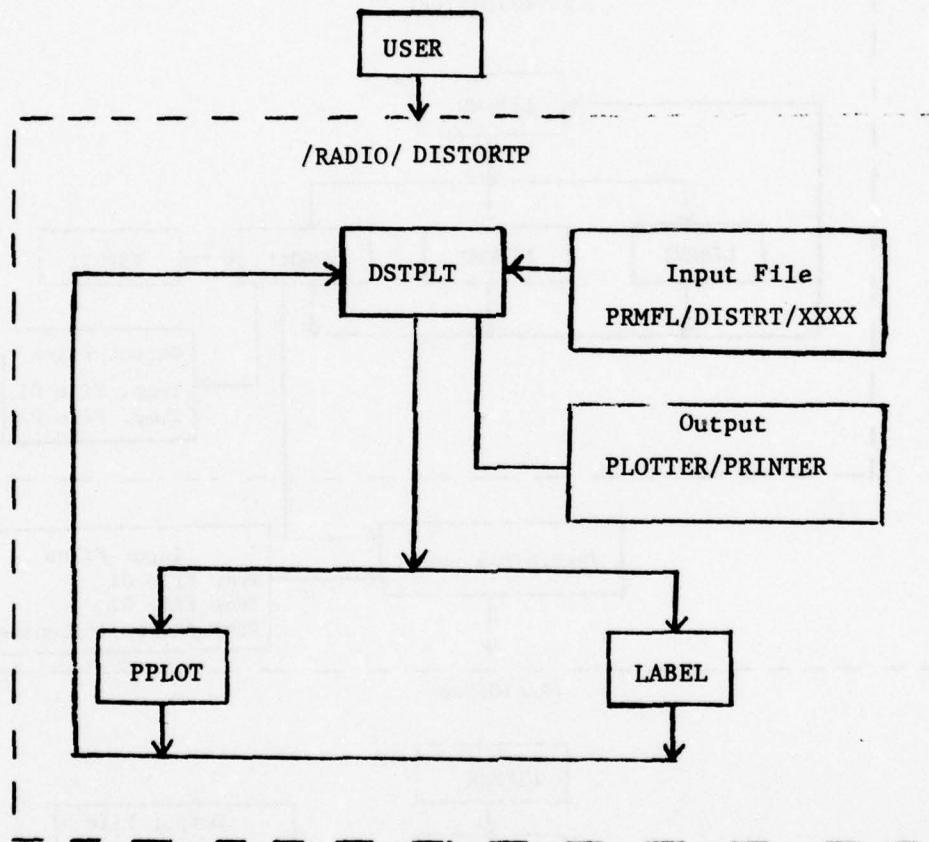


#### 4.6.2 Subsystem Interconnection Block Diagram for the Computing Activity



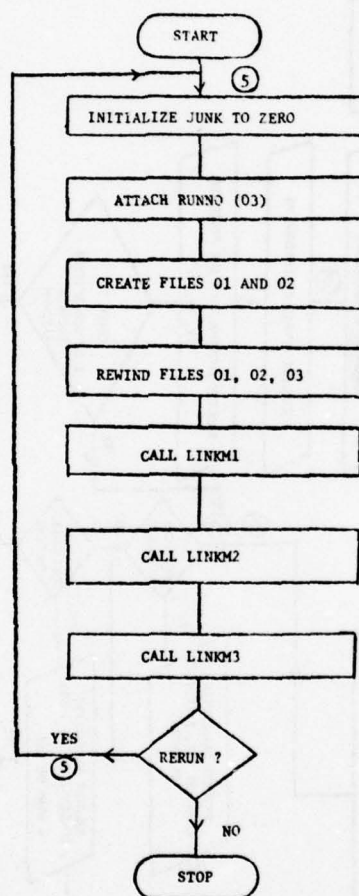


4.6.3 Subsystem Block Diagram for the Plotting Activity

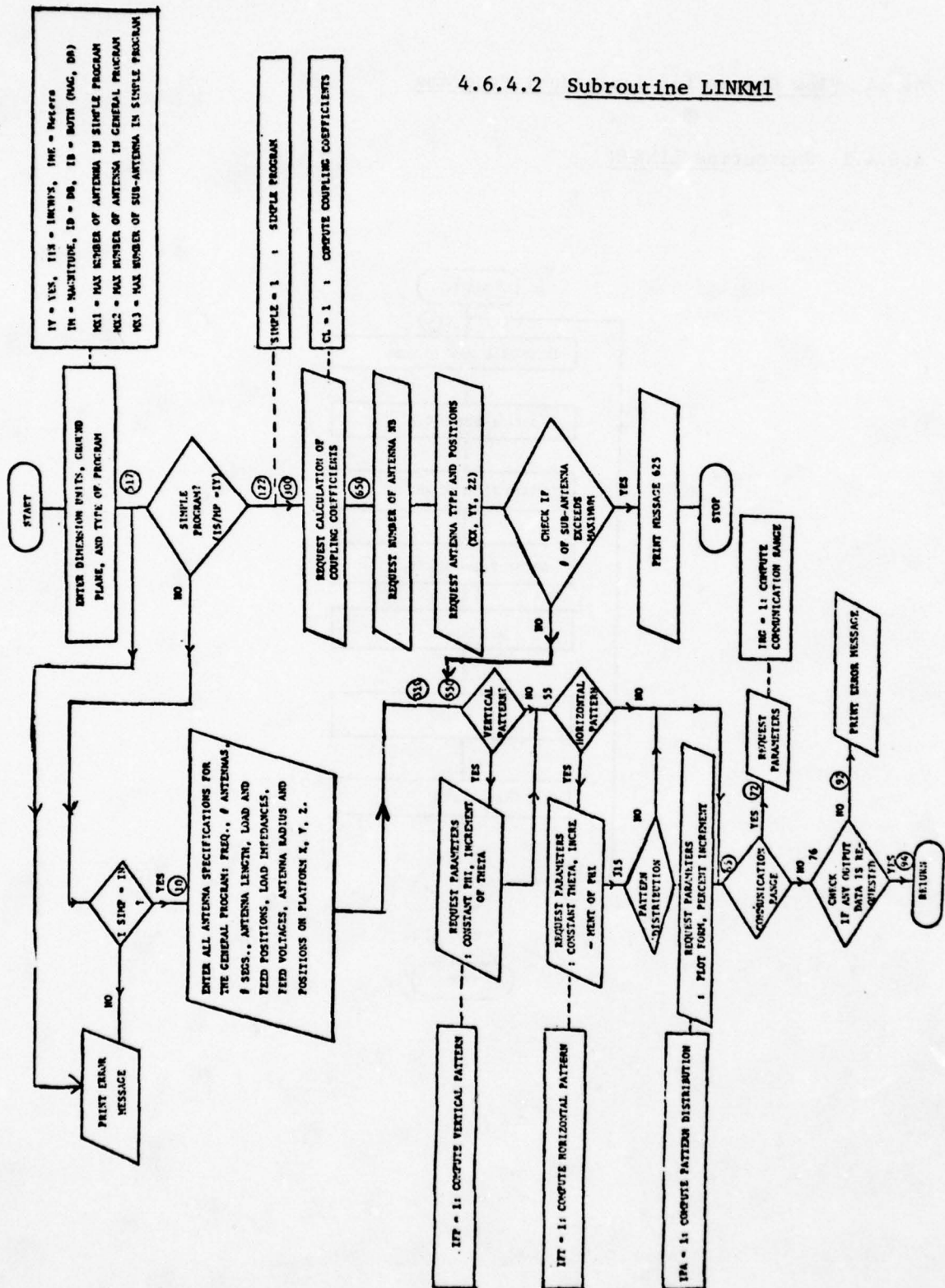


#### 4.6.4 Flow Charts for Individual Programs

##### 4.6.4.1 Subroutine LINKMN

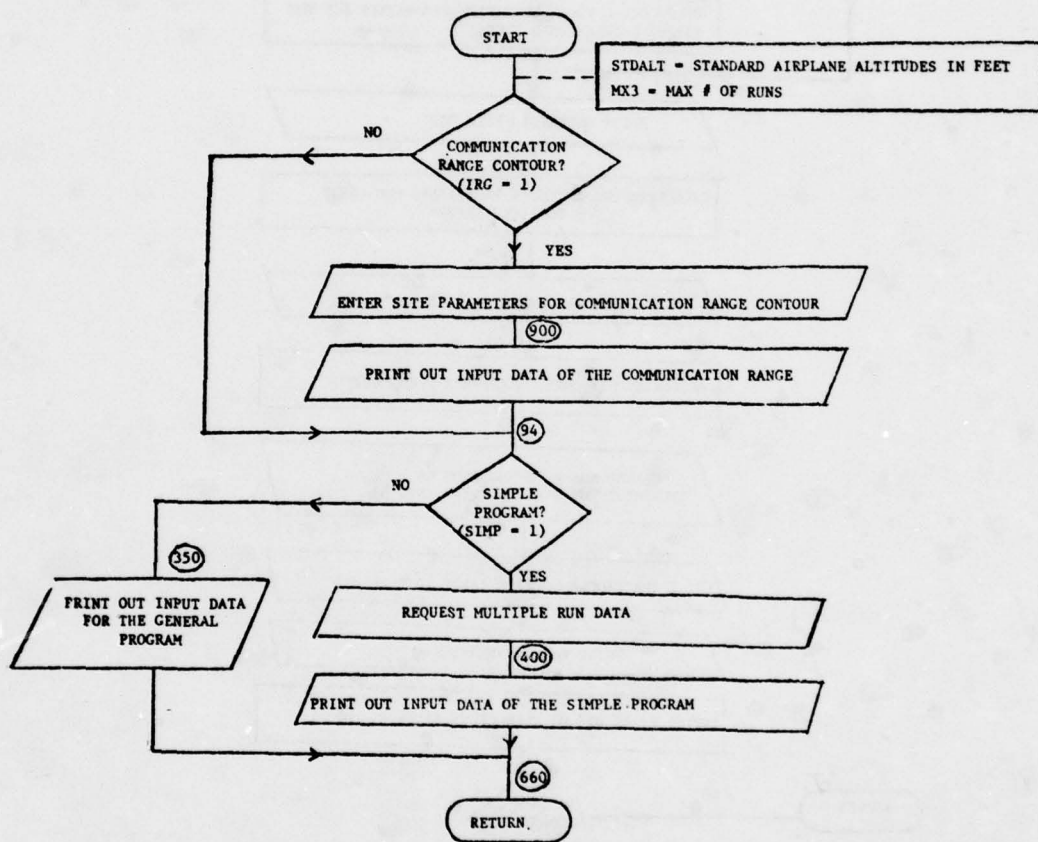


## 40

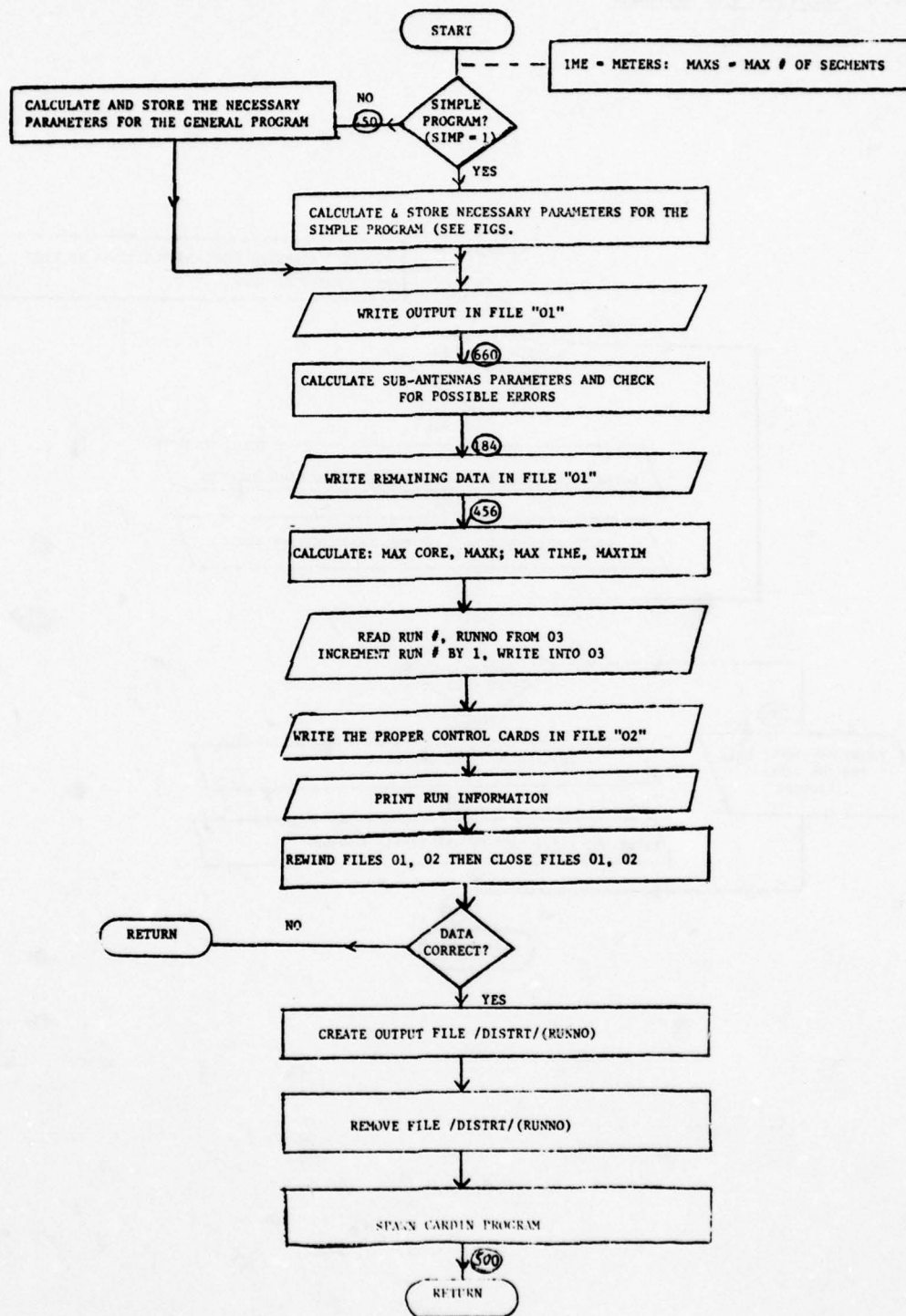




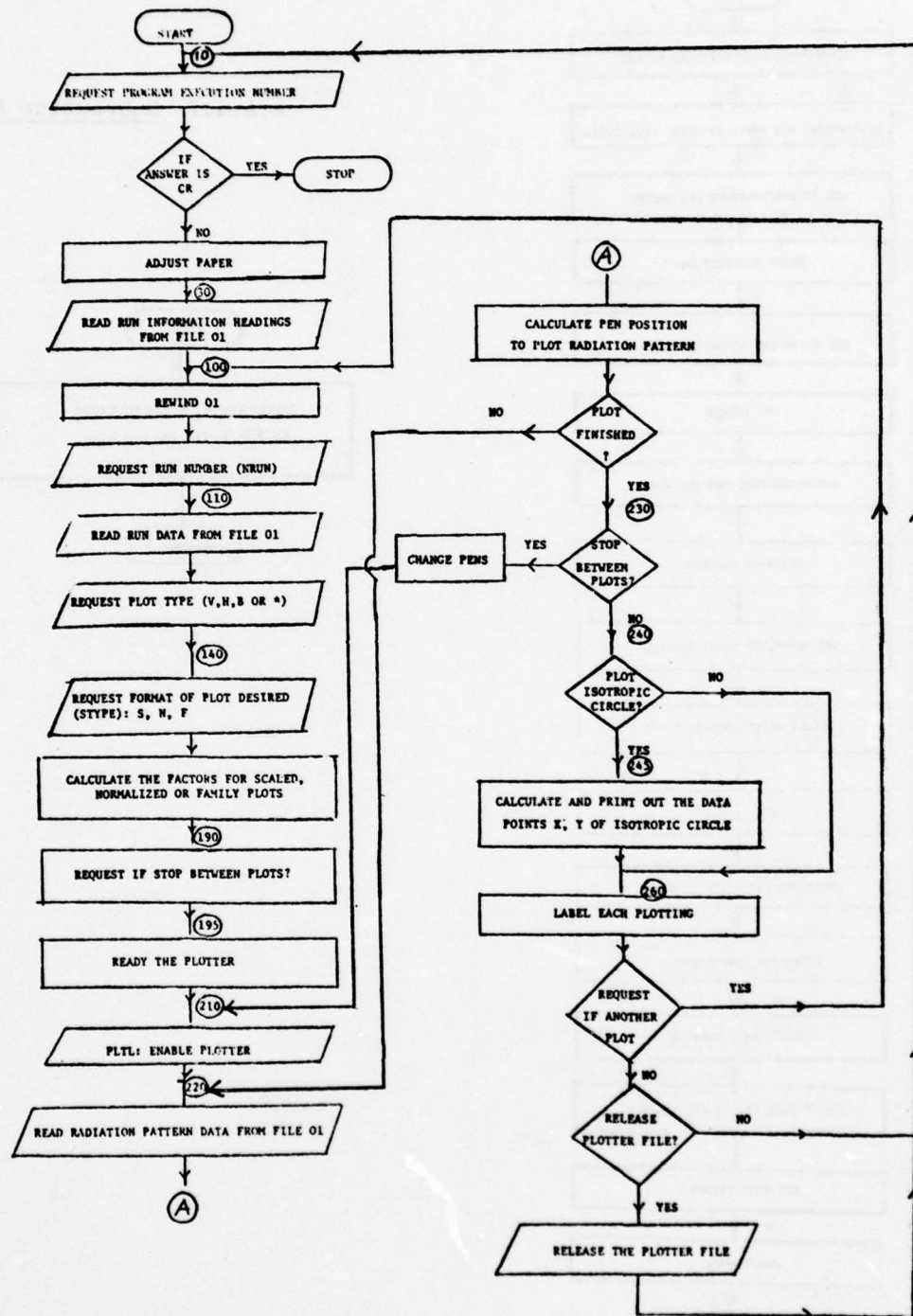
#### 4.6.4.3 Subroutine LINKM2



#### 4.6.4.4 Subroutine LINKM3

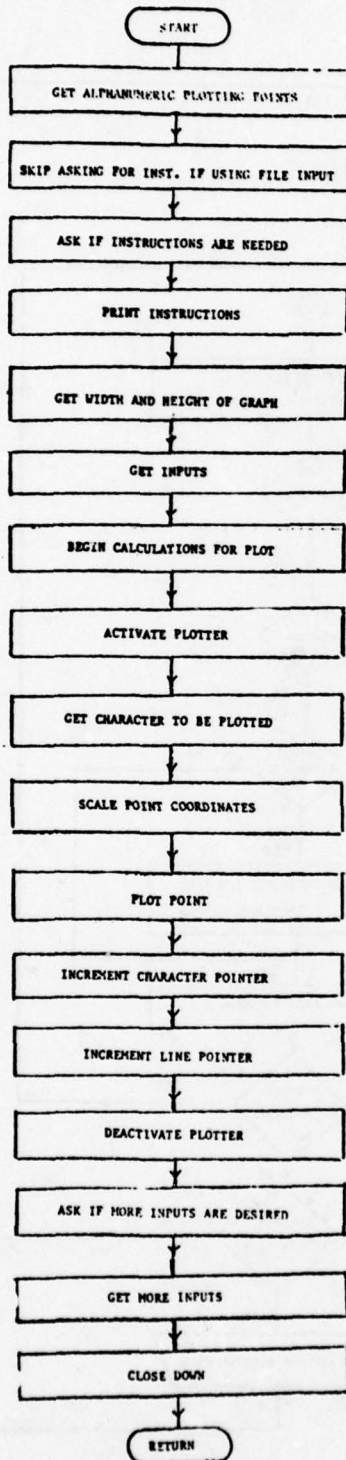


#### 4.6.4.5 Subroutine DSPLT

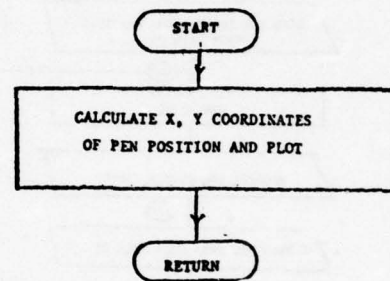




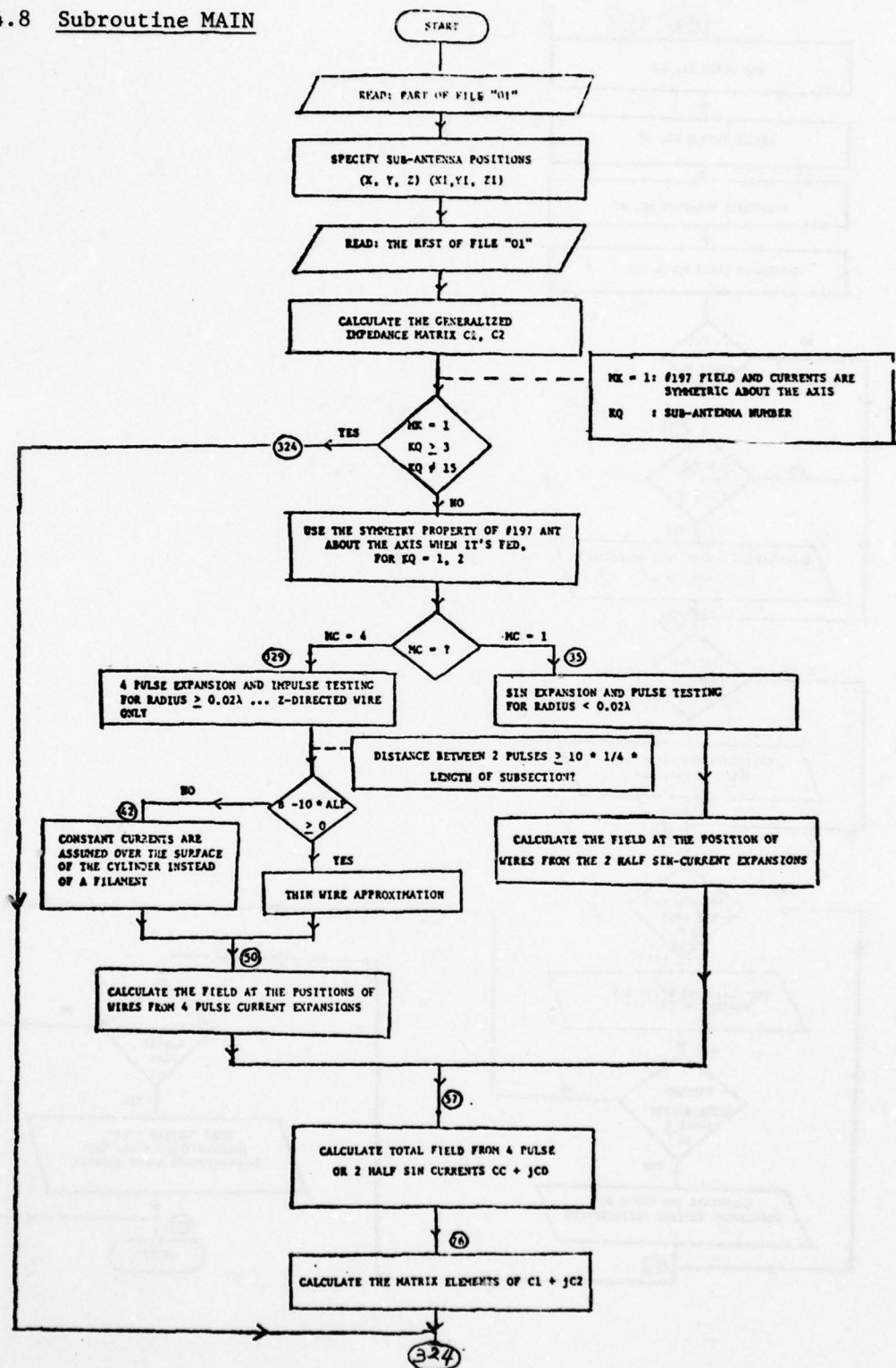
#### 4.6.4.6 Subroutine LABEL

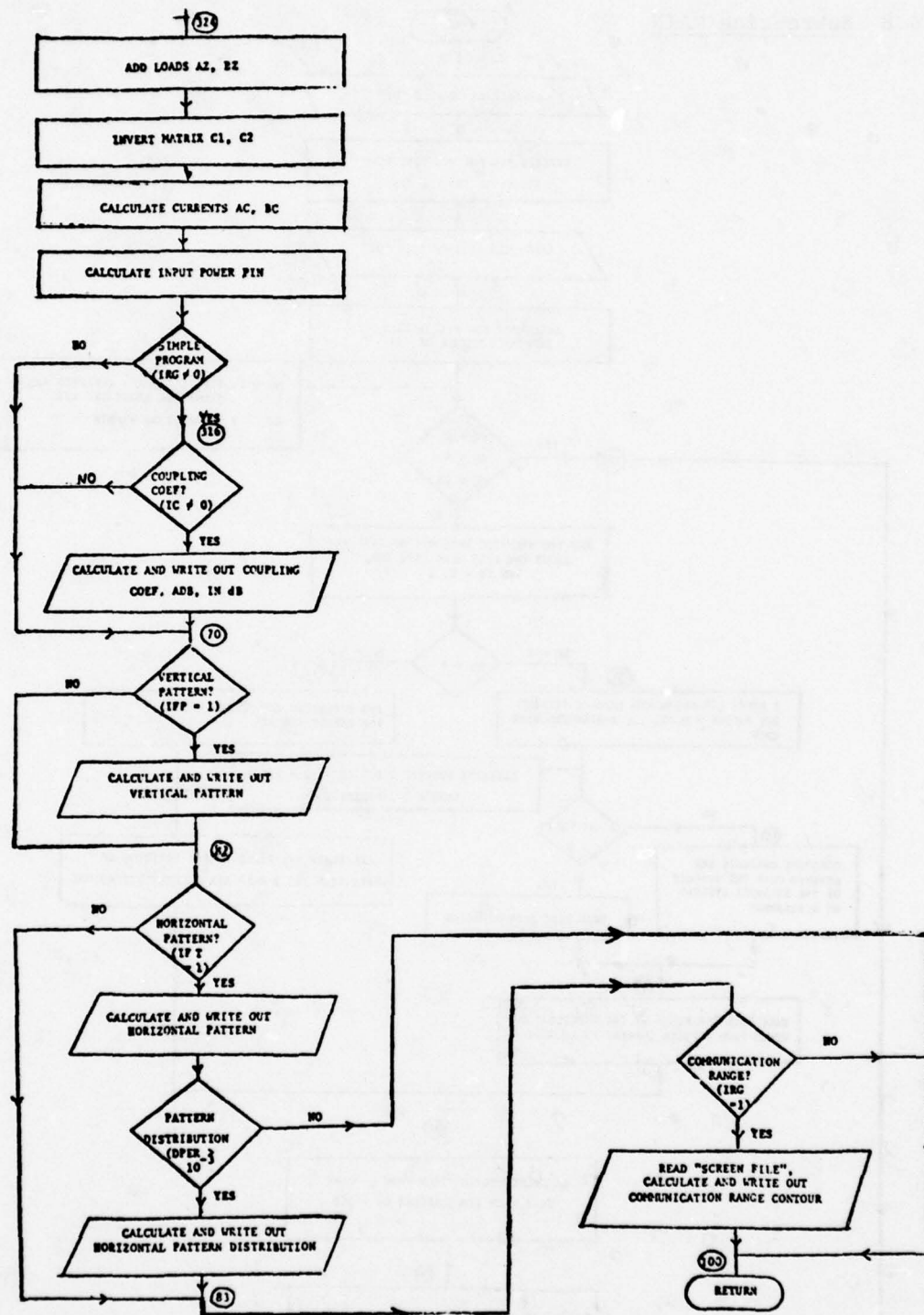


#### 4.6.4.7 Subroutine PLOT



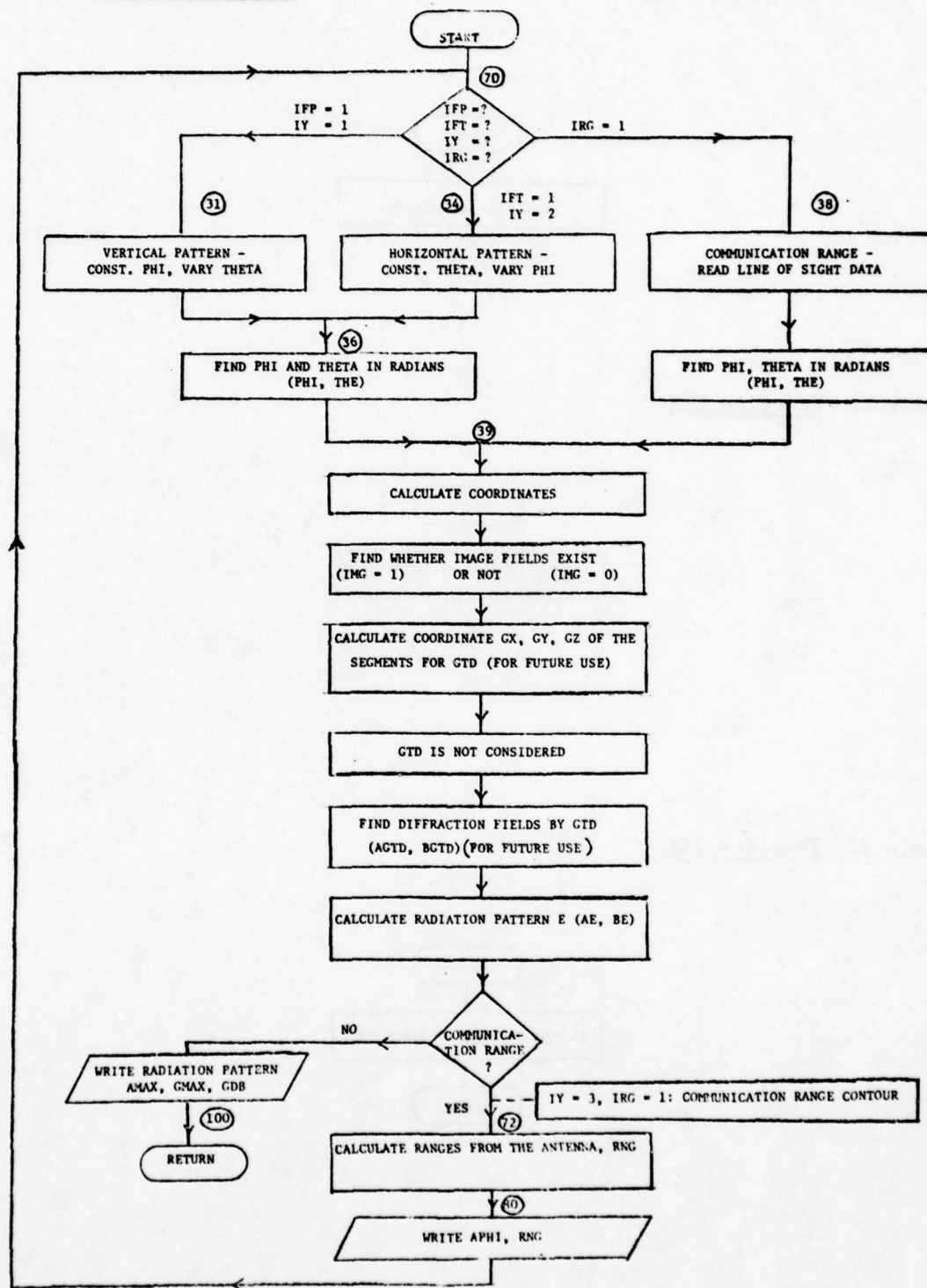
# 4.6.4.8 Subroutine MAIN



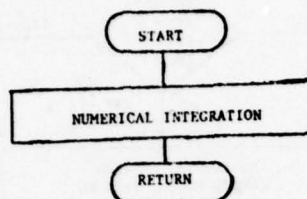




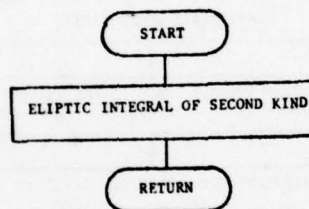
#### 4.6.4.9 Subroutine PATT



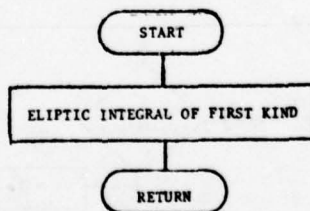
4.6.4.10 Subroutine FUN



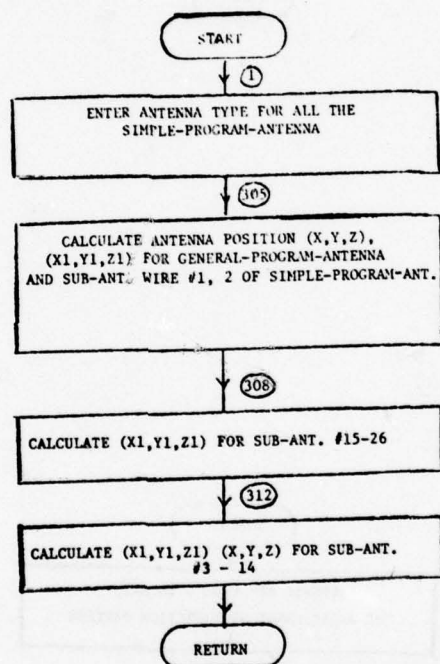
4.6.4.11 Function ELE



4.6.4.12 Function ELK

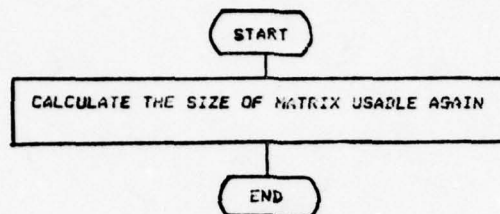


4.6.4.13 Subroutine PXYZ

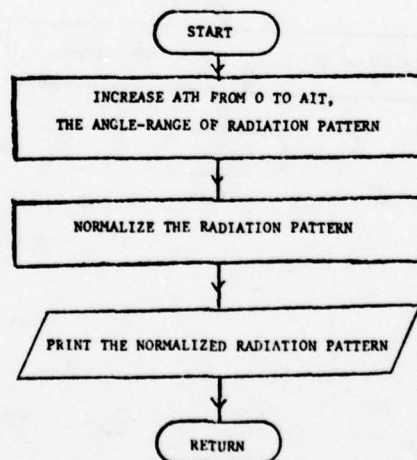




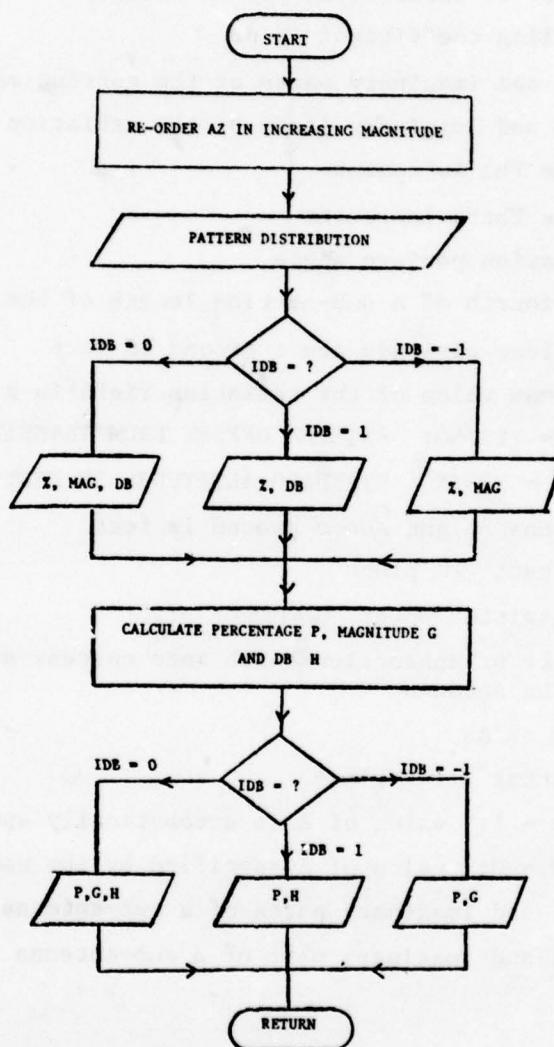
4.6.4.14 Subroutine QZP



4.6.4.15 Subroutine NPAT



#### 4.6.4.16 Subroutine PATD



#### 4.7 List of Principal Symbols

##### A

A	Number of subsections per wavelength
ADB	Coupling coefficient in dB
AC, BC	Real and imaginary parts of the current matrix
AE, BE	Real and imaginary parts of the radiation field
AINP	Angle Phi increment
AINP	Angle Theta increment
AIT	Radiation pattern angle
ALP	One-fourth of a sub-section length of the test wire.
ALT	Airplane altitude above ground in feet
AMAX	Maximum value of the radiation field in a specific pattern
ANSV	ANSV= YES/NO: ANTENNA OFFSET FROM TRANSIT?
ANSW	ANSW = YES/NO: STANDARD ALTITUDES IN FEET
ANTEL	Antenna height above ground in feet
APHI	Constant Phi plane
APIN	Transmitter power (WATTS)
AS	Number of subsections with zero current at each end of the antenna
AT	Same as AS
ATHI	Constant Theta plane
AUTO	AUTO = 1: value of A is automatically specified AUTO = 0: value of A specified by the user
AV, BV	Real and imaginary parts of a sub-antenna feed voltage
AZ, BZ	Real and imaginary part of a sub-antenna load impedance

##### B

B	Distance between two pulses of expansion or testing functions.
BEAR	Antenna bearing in Degrees and Minutes (DD, MM).
BTA	Antenna bearing from the North



C

CL                    CL = 1: Compute coupling coefficients  
                     CL = 0: Do not compute coupling coefficients  
C1, C2               Real and imaginary parts of the generalized impedance matrix

D

DBM                   Receiver sensitivity in dBm  
DIST                   Distance between screen and transit in feet  
PPER                   Percent increment of pattern distribution  
DTA                   Distance between antenna and transit in feet

E

ELANG                   Elevation angle from transit in radians

F

FA                    Height of the bottom of the fed antenna in SIMPLE PROGRAM  
FILENAME               Name of SCREEN file  
FP                    Operating frequency in Hz  
FR                    Operating frequency in MHz

G

GMAX                   Maximum gain  
GP                    GP = 1; with ground plane  
                     GP = 0; without ground plane  
GREL                   Ground elevation above mean sea level (MSL) in feet

## H

H1 Load position measured from sub-antenna bottom  
H3 Feed position measured from sub-antenna bottom  
H4 Lighting rod length  
H5 Lighting rod diameter  
H0 Sub-antenna length  
HSCRN Screen height in meters

## I

IALP Vertical pattern  
IALT Horizontal pattern  
IAUTO IAUTO = YES/NO: answer to AUTO SPEC # SEGS  
IB Both (MAG, DB)  
IC IC = 1: compute coupling coefficients  
IC = 0: do not compute coupling coefficients.  
ICL ICL = YES/NO answer to COUPLING COEFFICIENTS?  
ID in dB  
IDB IDB = -1, pattern in magnitude  
IDB = 0, pattern in dB  
IDB = 1, pattern in magnitude and dB  
IDD IDD = M, plot in magnitude  
IDD = D, plot in dB  
IDD = B, plot in magnitude and dB  
IDIM Dimensions of generalized impedance matrix (C1, C2)  
IF Feed position of sub-antenna  
IFP IFP = 1, vertical pattern  
IFP = 0, otherwise  
IFT IFT = 1, horizontal pattern  
IFT = 0, otherwise  
IG IG = 1, with ground plane  
IG = 0, without ground plane  
IGP IGP = YES/NO: answer to GROUND PLANE?  
II2 II2 = 1,  $(BZ)^2 \neq 0$   
II2 = 0, otherwise

II4	II4 = 1, $(BV)^2 \neq 0$ II4 = 0, otherwise
II6	II6 = 1, $AZ > 0$ II6 = 0, otherwise
IIN	Dimensions in inches
IM	In magnitude
IME	Dimension in meters
IN	No
IPA	IPA = 1, Compute pattern distribution IPA = 0, Do not compute pattern distribution
IPD	IPD = YES/NO: answer to PATTERN DISTRIBUTION
IRG	IRG = 1, Compute communication range IRG = 0, Do not compute communication range
IRGE	IRGE = YES/NO: answer to COMMUNICATION RANGE CONTOUR?
ISIMP	ISIMP = YES/NO: answer to SIMPLE PROGRAM?
IT	Type of antenna in SIMPLE PROGRAM
IV	Fed antenna number
IZ	Feed and load position
 <u>J</u>	
JQ	Number of test field calculations for numerical integration of the pulse testing
 <u>K</u>	
K	Total number of sub-antennas (wires), column index of the Z-matrix
K2	K2 = 1, without ground plane K2 = 2, with ground plane
KQ	Sub-antenna (wire) number, column index of the Z-matrix
KS	Antenna number, column index of the Z-matrix
KW	Number of runs



L

L Total number of sub-antennas, row index of the Z-matrix  
L1 Load positions of sub-antenna  
LQ Sub-antenna number, row index of the Z-matrix  
LS Antenna number, row index of the Z-matrix

M

MAXK Maximum core  
MAXS Maximum number of sub-sections  
MAXTIM Maximum time required by job  
MC MC = 1, sine expansion and pulse testing for radius less than 0.02 of wavelength  
MC = 4, Four pulse expansion (approximation of a triangle) and impulse testing for radius greater than or equal to 0.02 of wavelength ... z-directed wire only,  
MK MK = 1, AT 197 fed, currents assumed symmetrical about the axis  
MK = 0, Otherwise  
ML Same as MK  
MM Maximum number of segments  
MV MV = 0, vertical wires  
MV = 1, #13-#14 wires of AT 197 antenna  
AV = 2, #15-#16 wires of AT 197 antenna  
MW Same as MV

N

NA Number of airplane altitudes above ground, in feet, to be calculated (1 to 6 altitudes)  
NB Number of antennas in the SIMPLE program,  
NB = 0, GENERAL program  
NFP Number of field points in the horizontal pattern  
NK Number of sub-antennas (wires):  
NK = 1 for AT 1181; NK = 5 for AT 1097; NK = 26 for AT 197

NL	Same as NK
NM	Maximum number of segments
NN	Number of antennas in the GENERAL PROGRAM; number of sub-antennas in the SIMPLE PROGRAM
NP	Number of non-zero currents on an antenna
NS	Number of sub-sections of sub-antenna
NZ	Total number of feed and load with coupling coefficients computed

# R

R2	Earth diameter in feet
R3	Equivalent earth radius in meters for ray tracing (4/3 radius)
RA	Radius of sub-antenna
RNG	Ranges in nautical miles for antenna

# S

SIMP	SIMP = 0, GENERAL program SIMP = 1, SIMPLE program
STDALT	Standard airplane altitudes in feet

# T

TRANEL	Transit elevation
TTH	Elevation angle from the antenna bottom to screen in radians

# X

X,Y,Z	Bottom position of antenna in GENERAL program
XX,YY,ZZ	Bottom position of antenna in SIMPLE program
X1,Y1,Z1	Top end position of sub-antenna

# APPENDIX I

## Program Listing

```

108      FORTRAN ASCII,NFORM,NLNO
20 SUBROUTINE LINKMN
30 COMMON JUNK(5123)
40 IY=11953782816
50 5 DO 10 I=1,3423
60 10 JUNK(I)=0
70 CALL ATTACH(03,"BLA00001/RADIO/NORUN;",3,0,ISTAT,)
80 CALL CREATE(01,4000,0,ISTAT)
90 CALL CREATE(02,4000,0,ISTAT)
100 REWIND 01; REWIND 02; REWIND 03
110 CALL LINKM1
120 CALL LINKM2
130 CALL LINKM3
140 PRINT:"RERUN?"; READ 1000,JUNK(1)
150 1000 FORMAT(A1)
160 IF(JUNK(1).NE.IY)STOP
170 GO TO 5
180 END
190S      FORTRAN ASCII,NFORM,NLNO
200 SUBROUTINE LINKM1
210 COMMON A,H0,H1,H3,RA,X,Y,Z,AV,BV,AZ,BZ,NS,L1,IF,IT,XX,YY,ZZ,IZ,
220 FR,IV,IIM,GP,SIMP,NN,AUTO,KW,CL,NB,AINT,AIMP,APHI,ATHE,IPA,IPD
230 H,H4,H5,IFP,IFT,IRG,DBM,ISIMP,ICL,IALP,XALT,IRGE,IAUTO,IGP,IDD
240 ALT(6),GREL,TRANEL,ANTEL,NA,DTA,BTA,APIN,FA,IDB,DPER,FILENAME
250 DIMENSION A(200),H0(200),H1(200),H3(200),RA(200),X(200),Y(200),
260 AZ(200),AV(200),BV(200),AZ(351),BZ(200),NS(200),L1(200),IF(200),
270 IT(20),XX(20),YY(20),ZZ(20),IZ(40),FR(10),IV(10),H4(20),H5(20),
280 FA(40),STDALT(6) ; CHARACTER FILENAME*8
290 IY=11953782816; IN=10477387808
300 IB=88665775072; ID=9135210528; IM=10343170080
310*
320*   ***IY=YES, IN=NO, IIN=INCHES, IME=METERS
330*   ***IM=MAGNITUDE, ID=OB, IB=BOTH(MAG,DB)
340*
350 IIN=9806299168; IME=10343170080
360 ABW=0.
370 MX1=20; MX2=200
380*
390*   ***MX1=MAXIMUM NUMBER OF ANTENNAS IN THE SIMPLE PROGRAM
400*   ***MX2=MAXIMUM NUMBER OF ANTENNAS IN THE GENERAL PROGRAM
410*   ***MX2=MAXIMUM NUMBER OF SUB-ANTENNAS IN THE SIMPLE PROGRAM
420*   ***ENTER DIMENSION UNITS, GROUND PLANE AND TYPE OF PROGRAM
430*
440 510 PRINT:" DIMENSIONS IN METERS OR INCHES ?"
450 READ 515,IIM
460 IF(IIM-IIN) 102,106,102
470 102 IF(IIM-IME) 104,106,104
480 104 PRINT 502;GO TO 510
490 502 FORMAT(" ..... INPUT ERROR, TRY AGAIN .....")
500 106 PRINT:" GROUND PLANE ?"
510 READ 515,IGP
520 IF(IGP-IY) 112,116,112

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LNKMN

LNKM1A



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530 112 IF(IGP-IN) 114,517,114
540 114 PRINT 502;GO TO 106
550 116 GP=1.
560*
570*   ***GP=1. : WITH THE GROUND PLANE
580*
590 515 FORMAT(A1)
600 517 PRINT:" SIMPLE PROG ?"
610 READ 515,ISIMP
620 IF(ISIMP-1) 124,122,124
630 122 SIMP=1;GO TO 300
640*
650*   ***SIMP=1. :SIMPLE PROGRAM
660*
670 124 IF(ISIMP-IN) 126,10,126
680 126 PRINT 502;GO TO 517
690*
700*   ***ENTER ALL ANTENNA SPECIFICATIONS FOR THE GENERAL PROGRAM :
710*   ***FREQ., # ANTENNAS, #SEGS., ANTENNA LENGTH,LOAD & FEED POSITIONS
720*   ***LOAD IMPEDANCE, FEED VOLTAGE, RADIUS OF ANTENNA AND POSITION OF
730*   ***ANTENNA ON PLATFORM X,Y,Z
740*
750 10 PRINT:" FREQUENCY (MHZ)";READ:FR(1)
760 IF(FR(1).LE.0.) PRINT 502
770 IF(FR(1).LE.0.) GO TO 10
780 605 PRINT:" NUMBER OF ANTENNAS ";READ:NN
790 IF(NN.GT.0.AND.NN.LE.MX2) GO TO 520
800 IF(NN.LE.0) PRINT 502;IF(NN.LE.0) GO TO 605
810 PRINT 625;GO TO 605
820 520 PRINT:" AUTO SPEC #SEGS ?"
830 READ 515,IAUTO
840 IF(IAUTO-1) 132,136,132
850 132 IF(IAUTO-IN) 134,138,134
860 134 PRINT 502;GO TO 520
870 136 AUTO=1.
880*
890*   ***AUTO=1. : WITH AUTO SPEC #SEGS
900*
910 138 DO 285 I=1,NN
920 PRINT 274,I
930 274 FORMAT(" **** ANTENNA NUMBER",I3," ****")
940 IF(IAUTO.EQ.1) GO TO 2
950 3 PRINT:" NUMBER OF SEGMENTS PER WAVE-LENGTH "
960 READ:A(I)
970 IF(A(I).LE.0.) PRINT 502;IF(A(I).LE.0.) GO TO 3
980 2 PRINT:" ANTENNA LENGTH"
990 READ:H0(I)
1000 IF(H0(I).LE.0.) PRINT 502;IF(H0(I).LE.0.) GO TO 2
1010 610 PRINT:" LOAD POSITION"
1020 READ:H1(I)
1030 IF(H1(I).GE.0..AND.H1(I).LT.H0(I)) GO TO 620
1040 PRINT 502;GO TO 610

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1050 620 PRINT:" FEED POSITION"
1060 READ:H3(I)
1070 IF(H3(I).GE.0..AND.H3(I).LT.H0(I)) GO TO 622
1080 PRINT 502;GO TO 620
1090 622 PRINT:" ANTENNA RADIUS"
1100 READ:RA(I)
1110 IF(RA(I).LE.0.) PRINT 502;IF(RA(I).LE.0.) GO TO 622
1120 IF(IIM-IME) 162,166,166
1130 162 IF(RA(I)-1240./FR(1)) 168,166,164
1140 164 PRINT 502;GO TO 622
1150 166 IF(RA(I)-31./FR(1)) 168,168,164
1160 168 PRINT:" ANTENNA POSITION X,Y,Z ON THE PLATFORM"
1170 READ:X(I),Y(I),Z(I)
1180 IF(IIM.EQ.IIN) FA(I)=Z(I)*.0254
1190 IF(IIM.EQ.IME) FA(I)=Z(I)
1200 IF(GP.LT..5.OR,Z(I).GE.0.) GO TO 67
1210 PRINT 502;GO TO 168
1220 67 PRINT:" FEED VOLTAGE (REAL,IMAG)"
1230 READ:AV(I),BV(I)
1240 PRINT:" LOAD IMPEDANCE (REAL,IMAG) "
1250 READ:AZ(I),BZ(I)
1260 ABX=ABW+AV(I)**2+BV(I)**2
1270 285 CONTINUE
1280 IF(ABW-1.E-8) 56,56,310
1290 56 PRINT 573
1300 573 FORMAT(" **<F>**  << NO ANTENNAS ARE FED >>")
1310 DO 57 I=1,NM
1320 PRINT 274,I
1330 PRINT:" FEED VOLTAGE (REAL,IMAG) "
1340 57 READ:AV(I),BV(I)
1350 GO TO 310
1360*
1370* ***REQUEST CALCULATION OF COUPLING COEFFICIENTS
1380*
1390 300 PRINT:" COUPLING COEFFICIENTS ?"
1400 CL=0.
1410 READ 515,ICL
1420 IF(ICL-1) 172,176,172
1430 172 IF(ICL-IN) 174,650,174
1440 174 PRINT 502;GO TO 300
1450 176 CL=1.
1460*
1470* *** CL=1. :COMPUTE COUPLING COEFFICIENTS
1480*
1490* ***REQUEST NUMBER OF ANTENNAS , NB
1500*
1510 650 PRINT:" NUMBER OF ANTENNAS"
1520 READ:NB
1530 IF(NB.LE.0) PRINT 502;IF(NB.LE.0) GO TO 650
1540 IF(CL.GT..5.AND,NB.EQ.1) PRINT 7
1550 IF(CL.GT..5.AND,NB.EQ.1) GO TO 300
1560 7 FORMAT(" **<F>**  << # OF ANT. GREATER THAN ONE (COUPLING

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15704 COEF, ) >>")
1580 IF(NB.GT.MX1) PRINT 625
1590 625 FORMAT(" **<F>**  << TOO MANY ANTENNAS >>")
1600 IF(NB.GT.MX1) GO TO 650
1610*
1620*   ***REQUEST ANTENNA TYPES AND POSITIONS XX, YY, ZZ
1630*
1640 DO 295 I=1,NB
1650 PRINT 274,I
1660 530 PRINT:" ANTENNA TYPE ? (1097, 197, 1181 OR 1000)"
1670 READ:IT(I)
1680 IF(NB.EQ.1.AND.IT(I).EQ.1000) PRINT 502
1690 IF(NB.EQ.1.AND.IT(I).EQ.1000) GO TO 650
1700 IF(IT(I)-1097) 182,586,182
1710 182 IF(IT(I)-1181) 184,586,184
1720 184 IF(IT(I)-197) 200,586,200
1730 200 IF(IT(I)-1000) 202,186,202
1740 186 PRINT:" LENGTH";READ:H4(I)
1750 IF(H4(I).LE.0.) PRINT 502;IF(H4(I).LE.0.) GO TO 186
1760 4 PRINT:" DIAMETER";READ:H5(I)
1770 IF(H5(I).LE.0.) PRINT 502;IF(H5(I).LE.0.) GO TO 4
1780 GO TO 586
1790 202 PRINT 502;GO TO 530
1800 586 PRINT:" ANTENNA POSITION X,Y,Z ON THE PLATFORM"
1810 READ:XX(I),YY(I),ZZ(I)
1820 41 IF(GP.LT..5.OR.ZZ(I).GE.0.) GO TO 69
1830 PRINT 502;GO TO 586
1840 69 IF(IIM.EQ.IIN) FA(I)=ZZ(I)*.0254
1850 IF(IIM.EQ.IIN) FA(I)=ZZ(I)
1860 N9=1
1870 IF(IT(I).EQ.1097) N9=5
1880 IF(IT(I).EQ.197) N9=26
1890 NN=NN+N9
1900 295 CONTINUE
1910*
1920*   ***CHECK IF THE # OF SUB-ANTENNAS NN EXCEEDS MAXIMUM
1930*
1940 IF(NN.GT.MX2) PRINT 625
1950 IF(NN.GT.MX2) STOP
1960 310 PRINT:"+++ RADIATION PATTERN +++"
1970*
1980*   *** VERTICAL PATTERN ?
1990*
2000 550 PRINT:" VERTICAL PATTERN ?"
2010 READ 515,IALP
2020 IF(IALP-YY) 232,236,232
2030 232 IF(IALP-IN) 234,55,234
2040 234 PRINT 502;GO TO 550
2050*
2060*   ***IFP=1 : COMPUTE VERTICAL PATTERN
2070*
2080*   ***REQUEST PARAMETERS :CONSTANT PHI, INCREMENT OF THETA

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2090*
2100 236 IFF=1
2110 79 PRINT:" PHI (DEGREES) ";READ:APHI
2120 580 PRINT 380;READ:AINP
2130 IF(ABS(AINP).GE..01) GO TO 55
2140 PRINT 502;GO TO 580
2150*
2160*   ***HORIZONTAL PATTERN ?
2170*
2180 55 PRINT:" HORIZONTAL PATTERN ?"
2190 READ 515,IALT
2200 IF(IALT-IY) 242,246,242
2210 242 IF(IALT-IN) 244,65,244
2220 244 PRINT 502;GO TO 55
2230 246 IFT=1
2240*
2250*   ***IFT=1 : COMPUTE HORIZONTAL PATTERN
2260*
2270*   ***REQUEST PARAMETERS :CONSTANT THETA, INCREMENT OF PHI
2280*
2290 89 PRINT:" THETA (DEGREES) ";READ:ATHE
2300 590 PRINT 380;READ:AINP
2310 IF(ABS(AINP).GE..01) GO TO 315
2320 PRINT 502;GO TO 590
2330 380 FORMAT(" PLOTTING INCREMENT (NON-ZERO NUMBER) (DEGREES)")
2340*
2350*   ***PATTERN DISTRIBUTION ?
2360*
2370 315 PRINT:" PATTERN DISTRIBUTION ?"
2380 READ 515,IPD
2390 IF(IPD-IY) 320,330,320
2400 320 IF(IPD-IN) 325,65,325
2410 325 PRINT 502;GO TO 315
2420 330 IPA=1
2430*
2440*   ***IPA=1 :COMPUTE PATTERN DISTRIBUTION
2450*
2460*   ***REQUEST PARAMETERS :PLOT FORM , PERCENT INCREMENT
2470*
2480 335 PRINT:" PLOT IN MAG, DB, OR BOTH ?"
2490 READ 515,IDD
2500 IF(IDD.EQ.IM) IDB=-1
2510 IF(IDD.EQ.IB) IDB=0
2520 IF(IDD.EQ.ID) IDB=1
2530 IF(IDD.NE.IM.AND.IDD.NE.ID.AND.IDD.NE.IB) PRINT 502
2540 IF(IDD.NE.IM.AND.IDD.NE.ID.AND.IDD.NE.IB) GO TO 335
2550 340 PRINT:" PERCENT INCREMENT";READ:DPER
2560 IF(DPER.LE..01) PRINT 502
2570 IF(DPER.LE..01) GO TO 340
2580 65 IF(SIMP.LT..5) GO TO 76
2590*
2600*   ***COMMUNICATION RANGE ?

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```

2610*
2620 500 POPMAT(A8)
2630 64 PRINT:" COMMUNICATION RANGE CONTOUR ?"
2640 IRG=0
2650 READ 515,IRGE
2660 IF(IRGE-IX) 70,72,70
2670 70 IF(IRGE-IN) 74,76,74
2680 74 PRINT 502;GO TO 64
2690 72 IRG=1
2700*
2710* ***IRG=1 : COMPUTE COMMUNICATION RANGE
2720*
2730* ***REQUEST PARAMETERS
2740 PRINT:"NAME OF SCREEN FILE"
2750 READ 500,FILENAME
2760 40 PRINT:" RECEIVER SENSITIVITY (DBM)"
2770 READ,DBM
2780 IF(DBM.GE.0.) PRINT 502;IF(DBM.GE.0.) GO TO 40
2790 15 PRINT:" GROUND TRANSMITTER POWER (WATT)"
2800 READ,APIN
2810 IF(APIN.LE.0.) PRINT 502;IF(APIN.LE.0.) GO TO 15
2820 76 IF(CL.GT..5) GO TO 94
2830 IAA=IFP+IFT+IRG
2840*
2850* ***CHECK IF ANY OUTPUT DATA IS REQUESTED
2860*
2870 IF(IAA) 92,92,94
2880*
2890* ***PRINT ERROR MESSAGE
2900*
2910 92 PRINT 502;GO TO 550
2920 94 RETURN;END
2930$ FORTRAN ASCII,NFORM,NLNO
2940 SUBROUTINE LINKM2
2950 ASCII ANSW,ANSV
2960 COMMON A,H0,H1,H3,RA,X,Y,Z,AV,BV,AZ,BZ,NS,L1,IF,IT,XX,YY,ZZ,IZ,
2970&FR,IV,IIM,GP,SIMP,NN,AUTO,KW,CL,NB,AINT,AINP,APHI,ATHE,IPA,IPD
2980&H4,H5,IFP,IFT,IRG,DBM,ISIMP,ICL,IALP,IALT,IRGE,IAUTO,IGP,IDD
2990&ALT(6),GREL,TRANEL,ANTEL,NA,DTA,BTA,APIN,FA,IDB,DPER,
3000&FILENAME
3010 DIMENSION A(200),H0(200),H1(200),H3(200),RA(200),X(200),Y(200),
3020&Z(200),AV(200),BV(200),AZ(361),BZ(200),NS(200),L1(200),IF(200),
3030&IT(20),XX(20),YY(20),ZZ(20),IZ(40),FR(10),IV(10),H4(20),H5(20),
3040&FA(40),STDALT(6);CHARACTER FILENAME *8
3050 IY=11953782816;IN=10477387808
3060 STDALT(1)=1000.
3070 STDALT(2)=5000.
3080 STDALT(3)=10000.
3090 STDALT(4)=15000.
3100 STDALT(5)=20000.
3110 STDALT(6)=35000.
3120 IIN=9806299168

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LINKM2A

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3130 MHHMM=1
3140*
3150*   ***STDALT=STANDARD AIRPLANE ALTITUDES IN FEET
3160*
3170 CDTR=3.1415927/180.
3180 MX3=10
3190*
3200*   ***MX3=MAXIMUM NUMBER OF RUNS
3210*
3220 IF(IRG.EQ.0) GO TO 94
3230*
3240*   ***ENTER SITE PARAMETER FOR COMMUNICATION RANGE CONTOUR
3250*
3260 PRINT:" "
3270 PRINT:"+++++ ENTER SITE PARAMETERS +++++"
3280 PRINT : " "
3290 PRINT:" GROUND ELEVATION IN FEET"
3300 READ:GREL
3310 PRINT:" TRANSIT ELEVATION IN FEET"
3320 READ:TFANEL
3330 PRINT:" ANTENNA ELEVATION IN FEET"
3340 READ : ANTEL
3350 45 PRINT:" ANTENNA OFFSET FROM TRANSIT ?"
3360 READ:ANSV
3370 IF(ANSV.EQ.IN) GO TO 60
3380 IF(ANSV.NE.IY.AND.ANSV.NE.IN) PRINT 502
3390 IF(ANSV.NE.IY.AND.ANSV.NE.IN) GO TO 45
3400 70 PRINT:" ENTER DISTANCE TO ANTENNA IN FEET"
3410 READ:DTA
3420 IF(DTA.LT.0.) PRINT 502;IF(DTA.LT.0.) GO TO 70
3430 PRINT:" BEARING TO ANTENNA IN DEG AND MIN (DD.MM)"
3440 READ:BEAR
3450 DEG=INT(BEAR)
3460 BTA=(DEG+(BEAR-DEG)/6.)*CDTR
3470 60 PRINT: " STANDARD ALTITUDES ?"
3480 READ : ANSW
3490 IF(ANSW.EQ. IY)GO TO 20
3500 IF(ANSW.NE.IY.AND.ANSW.NE.IN) PRINT 502
3510 IF(ANSW.NE.IY.AND.ANSW.NE.IN) GO TO 60
3520 24 PRINT : " NUMBER OF ALTITUDES TO BE CALCULATED (1-6)"
3530 READ : NA
3540 IF(NA.LT.1.OR.NA.GT.6) PRINT 502
3550 IF(NA.LT. 1 .OR. NA .GT. 6)GO TO 24
3560 PRINT:" DESIRED ALTITUDES IN FEET"
3570 READ : (ALT(I), I = 1,NA)
3580 GO TO 900
3590 20 NA=6
3600 DO 26 I = 1,NA
3610 ALT(I) = STDALT(I)
3620 26 CONTINUE
3630*
3640*   ***PRINT OUT INPUT DATA OF THE COMMUNICATION RANGE

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3650*
3660 900 PRINT 915,GREL,TRANEL,ANTEL
3670 IF(ANSV,EQ.IY) PRINT 916,DTA,BZAR
3680 916 FORMAT(" DIST TO ANT (FT) =",F8.1/,
3690&" BEAR TO ANT(DD.MM)=",F9.2,/)
3700 PRINT:"AIRCRAFT ALT'S ARE IN FT AGL."
3710 PRINT 917,(ALT(I),I=1,NA)
3720 245 CONTINUE
3730 915 FORMAT(//,"OGROUND ELEV =",F8.1," FT",//
3740&" TRANSIT ELEV =",F8.1," FT",/,
3750&" ANTENNA ELEV =",F8.1," FT",/)
3760 917 FORMAT(" ALT'S=",6F8.1,/)
3770 DTA=DTA*.3048
3780 ANTEL=ANTEL*.3048
3790 TRANEL=TRANEL*.3048
3800 GREL=GREL*.3048
3810 502 FORMAT(" ..... INPUT ERROR, TRY AGAIN .....")
3820 94 IF(SIMP,LT,.5) GO TO 350
3830*
3840* ***REQUEST MULTIPLE RUN DATA
3850*
3860 PRINT:" "
3870 192 PRINT:" NUMBER OF RUNS"
3880 READ:KW
3890 IF(KW.LE,0) GO TO 194
3900 IF(KW-MX3) 196,196,194
3910 194 PRINT 502;GO TO 192
3920 196 DO 228 J=1,KW
3930 IV(J)=0
3940 PRINT 140,J
3950 140 FORMAT(" **** RUN #",I3," ****")
3960 223 PRINT:" FREQUENCY (MHZ)";READ:FR(J)
3970 IF(FR(J).LE,0.) PRINT 502;IF(FR(J).LE,0.) GO TO 223
3980 FRE=FR(J)
3990 628 PRINT:" FED ANTENNA (#)";READ:IV(J)
4000 IW=IV(J)
4010 IF(IW) 224,224,222
4020 222 IF(IW-NB) 225,225,224
4030 224 PRINT 502;GO TO 628
4040 225 IF(IT(IW),EQ,1000) GO TO 224
4050 IF(FRE-200.) 226,226,227
4060 226 IF(IT(IW)-1097) 210,229,210
4070 210 IF(IT(IW)-197) 228,229,228
4080 227 IF(IT(IW)-1181) 228,229,228
4090 229 PRINT 502;GO TO 223
4100 228 CONTINUE
4110 GO TO 400
4120*
4130* ***PRINT OUT INPUT DATA OF THE GENERAL PROGRAM
4140*
4150 350 PRINT 42,IIM,IGP,IAUTO,FR(1),NN
4160 NQ=NN

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4170 IF(NN.GT.8) NQ=8
4180 PRINT 555,(I,I=1,NQ)
4190 555 FORMAT(" ANT# =",I6,7I8)
4200 IF(AUTO.GT..5) GO TO 4
4210 PRINT 14,(A(I),I=1,NN)
4220 4 PRINT 16,(PO(I),I=1,NN)
4230 PRINT 18,(H1(I),I=1,NN)
4240 PRINT 22,(H3(I),I=1,NN)
4250 PRINT 62,(RA(I),I=1,NN)
4260 PRINT 64,(X(I),I=1,NN)
4270 PRINT 28,(Y(I),I=1,NN)
4280 PRINT 30,(Z(I),I=1,NN)
4290 PRINT 32,(AV(I),I=1,NN)
4300 PRINT 34,(BV(I),I=1,NN)
4310 PRINT 36,(AZ(I),I=1,NN)
4320 PRINT 38,(BZ(I),I=1,NN)
4330 KW=1
4340 GO TO 450
4350*
4360* ***PRINT OUT INPUT DATA OF THE SIMPLE PROGRAM
4370*
4380 400 PRINT 12,IIM,IGP,ISIMP,ICL,NB
4390 NQ=NB
4400 IF(NB.GT.8) NQ=8
4410 PRINT 555,(I,I=1,NQ)
4420 PRINT 44,(IT(I),I=1,NB)
4430 PRINT 64,(XX(I),I=1,NB)
4440 PRINT 28,(YY(I),I=1,NB)
4450 PRINT 30,(ZZ(I),I=1,NB)
4460 HH1=0.05
4470 IF(IIM.EQ.IIN)HH1=HH1*0.0254
4480 DO 99 I=1,NB
4490 IF(IT(I).NE.1181) GO TO 99
4500 ZZ(I)=ZZ(I)+HH1
4510 99 CONTINUE
4520 DO 156 Y=1,NB
4530 IF(H4(I).GT.1.E-10) I18=1
4540 156 CONTINUE
4550 IF(I18.NE.0) PRINT 152,(H4(I),I=1,NB)
4560 IF(I18.NE.0) PRINT 154,(H5(I),I=1,NB)
4570 152 FORMAT(" L      =",8F8.3/(7X,8F8.3))
4580 154 FORMAT(" D      =",8F8.3/(7X,8F8.3))
4590 39 FORMAT(" VER PAT=",2X,A1)
4600 450 PRINT 39,IALP
4610 IF(IPP.EQ.0) GO TO 453
4620 PRINT 66,APHI,AINT
4630 453 PRINT 558,IALT
4640 IF(IPT.EQ.0) GO TO 78
4650 558 FORMAT(" HOR PAT=",2X,A1)
4660 PRINT 41,ATHE,AINP
4670 PRINT 300,IPD
4680 IF(IPA.EQ.0) GO TO 78

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4690 300 FORMAT(" PAT DIST=",1X,A1)
4700 PRINT 310,IDD,DPER
4710 310 FORMAT(" PLOT=",1X,A1,1X," INC=",F6.1," X")
4720 78 IF(SIMP.GT..5) PRINT 80,IRGE
4730 80 FORMAT(" COM RNG=",2X,A1)
4740 IF(IRG.EQ.0) GO TO 660
4750 PRINT 100,DBM,APIN
4760 100 FORMAT(" REC SEN (DBM)=",F7.1," GROUND TPW (WATT)=",F6.1)
4770 41 FORMAT(" THETA=",F6.1,1X," PLOT INC=",F7.2)
4780 12 FORMAT(///" DIM=",1X,A1,1X," GP=",1X,A1,1X," SIMP=",1X,A1,1X,
4790&" COUPL=",1X,A1,1X," NR=",I3)
4800 14 FORMAT(" #SEGS=",8F8.2/(7X,8F8.2))
4810 16 FORMAT(" L      =",8F8.3/(7X,8F8.3))
4820 18 FORMAT(" LP     =",8F8.3/(7X,8F8.3))
4830 22 FORMAT(" FP     =",8F8.3/(7X,8F8.3))
4840 62 FORMAT(" R      =",8F8.5/(7X,8F8.5))
4850 64 FORMAT(" X      =",8F8.3/(7X,8F8.3))
4860 28 FORMAT(" Y      =",8F8.3/(7X,8F8.3))
4870 30 FORMAT(" Z      =",8F8.3/(7X,8F8.3))
4880 32 FORMAT(" RE V   =",8F8.3/(7X,8F8.3))
4890 34 FORMAT(" IM V   =",8F8.3/(7X,8F8.3))
4900 36 FORMAT(" RE LD   =",8F8.1/(7X,8F8.1))
4910 38 FORMAT(" IM LD   =",8F8.1/(7X,8F8.1))
4920 42 FORMAT(///" DIM=",1X,A1,1X," GP=",1X,A1,1X," AUTO=",1X,A1,1X,
4930&" FREQ=",F8.2,1X," NR=",I3)
4940 44 FORMAT(" TYPE   =",8I8/(7X,8I8))
4950 66 FORMAT(" PHI    =",F6.1,1X," PLOT INC=",F7.2)
4960 660 RETURN;END
4970$   FORTRAN ASCII,NFORM,NLNO
4980 SUBROUTINE LINKM3
4990 COMMON A,H0,H1,H3,RA,X,Y,Z,AV,BV,AZ,BZ,NS,L1,IF,IT,XX,YY,ZZ,IZ,
5000&PA,IV,IIN,GP,SIMP,NN,AUTO,KW,CL,NB,AINT,AINF,APHI,ATHE,IPA,IPD
5010&,H4,H5,IFP,IFT,IRG,DBM,ISIMP,ICL,IALP,IALT,IRGE,IAUTO,IGP,IDD
5020&,ALT(6),GREL,TRANEL,ANTEL,NA,DTA,BTA,APIN,FA,IDB,DPER,FILENAME
5030 DIMENSION A(200),H0(200),H1(200),H3(200),RA(200),X(200),Y(200),
3040 &Z(200),AV(200),BV(200),AZ(361),BZ(200),NS(200),L1(200),IF(200),
5050 &IT(20),XA(20),YY(20),ZZ(20),IZ(40),FR(10),IV(10),H4(20),H5(20),
5060 &FA(40),SDALT(6);CHARACTER FILENAME*8
5070 INTEGER RUNNO
5080 MAXS=500;IME=10343170080
5090 IY=11953782816
5100*
5110*   ***IME=METERS
5120*   ***MAXS=MAXIMUM NUMBER OF SEGMENTS
5130*
5140 250 FORMAT(3I4,I2,2F3.0)
5150 252 FORMAT(9F7.3)
5160 254 FORMAT(8F8.5)
5170 256 FORMAT(6E11.3)
5180 258 FORMAT(4I3,4F7.2,F6.1)
5190 260 FORMAT(I5,15I4)
5200 AIN=1.

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LNKM3A



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5210 IF(IIM.NE.IME) AIM=.0254
5220 MX=1
5230 IF(SIMP.GT..5) PRINT 10
5240 10 FORMAT("//" RUN#      FREQ(MHZ)  ANT FED("#)")
5250 DO 456 L=1,KW
5260 LXY=0
5270 IJ=0
5280 FRE=FR(L)
5290 IF(SIMP.LT..5) GO TO 450
5300*
5310*   ***CALCULATE & STORE NECESSARY PARAMETERS FOR THE SIMPLE PROGRAM
5320*
5330 PRINT 30,L,FR(L),IV(L)
5340 30 FORMAT(I4,5X,F8,2,3X,X6)
5350 DO 350 I=1,NB
5360 NM=1
5370 IF(IT(I).EQ.1097) NM=5
5380 IF(IT(I).EQ.197) NM=26
5390 DO 340 J=1,NM
5400 AJ=J;IJ=IJ+1
5410 AV(IJ)=0.;BV(IJ)=0.
5420 AZ(IJ)=50.;BZ(IJ)=0.
5430 X(IJ)=XX(I)*AIM;Y(IJ)=YY(I)*AIM
5440 IF(IT(I).EQ.1000) GO TO 132
5450 IF(CL=1.) 142,145,145
5460 142 IF(FRE=200.) 143,143,144
5470 143 A(IJ)=8.5*250./FRE;GO TO 148
5480 144 A(IJ)=13.3*250./FRE;GO TO 148
5490 145 IF(FRE=200.) 144,144,146
5500 146 A(IJ)=14.8*300./FRE
5510 148 IF(IT(I).NE.197) GO TO 158
5520 AZ(IJ)=0.
5530 IF(J.EQ.1) GO TO 82
5540 IF(J.EQ.2) GO TO 84
5550 IF(J.LE.14) GO TO 86
5560 Z(IJ)=.51+ZZ(I)*AIM
5570 A(IJ)=11.8*300./FRE
5580 H0(IJ)=.17;RA(IJ)=.0035
5590 GO TO 340
5600 82 A(IJ)=4.2*300./FRE
5610 IF(CL.GT..5.OR.FRE.GT.200.) A(IJ)=6.25*300./FRE
5620 H0(IJ)=.48;RA(IJ)=.0175;Z(IJ)=ZZ(I)*AIM
5630 GO TO 340
5640 84 AZ(IJ)=50.;H0(IJ)=.03;RA(IJ)=.002
5650 Z(IJ)=.48+ZZ(I)*AIM
5660 IF(FRE.LE.200.) GO TO 340
5670 IF(IV(L).NE.I) GO TO 340
5680 AV(IJ)=1.;AZ(IJ)=0.
5690 LXY=1
5700 GO TO 340
5710 86 Z(IJ)=.48+ZZ(I)*AIM
5720 H0(IJ)=.45;RA(IJ)=.0045

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5730 A(IJ)=5.66*300./FRE
5740 IF(FRE.LE.200.) GO TO 46
5750 IF(IV(L).EQ.I.OR.CL.GT..5) A(IJ)=8.89*300./FRE
5760 GO TO 340
5770 46 IF(CL.LT..5) A(IJ)=4.44*300./FRE
5780 GO TO 340
5790 158 IF(NM.EQ.1) GO TO 320
5800 RA(IJ)=.0754;H0(IJ)=.54;H1(IJ)=.27;H3(IJ)=.27
5810 IF(J.EQ.5) GO TO 370
5820 GO TO 330
5830 370 RA(IJ)=.0191;H0(IJ)=.279;AZ(IJ)=0.;H1(IJ)=0.;H3(IJ)=0.
5840 A(IJ)=7.4*300/FRE
5850 GO TO 330
5860 320 RA(IJ)=.0628;H0(IJ)=1.1684;H1(IJ)=.8001;H3(IJ)=.8001
5870 330 Z(IJ)=ZZ(I)*AIN+(AJ-1.)*(H0(IJ)+.1461)
5880 IF(J.EQ.5) Z(IJ)=ZZ(I)*AIN+4.*.54+3.*.1461
5890 IF(IV(L).NE.I.OR.J.EQ.5) GO TO 340
5900*
5910*   ***CALCULATE ANTENNA AT1097 FEED VOLTAGES AV,BV
5920*
5930 AAA=J-1
5940 BETA=2.*3.141593*.04166*FRE/(.6951*300.)
5950 ABC=BETA*AAA
5960 IF(J.EQ.4) ABC=.00378094*FRE
5970 AV(IJ)=COS(ABC);BV(IJ)=-SIN(ABC);AZ(IJ)=0.
5980 A(IJ)=13.3*250./FRE
5990 IF(FRE.GT.200.) A(IJ)=14.8*300./FRE
6000 GO TO 340
6010 132 AZ(IJ)=0.;H1(IJ)=0.;Z(IJ)=ZZ(I)*AIN
6020 H0(IJ)=H4(I)*AIN;RA(IJ)=H5(I)*AIN/2.
6030 A(IJ)=4.*300./FRE
6040 IF(FRE.GT.200.) A(IJ)=6.*300./FRE
6050 340 CONTINUE
6060 350 CONTINUE
6070*
6080*   ***CALCULATE & STORE NECESSARY PARAMETERS FOR THE GENERAL PROGRAM
6090*
6100 450 KK=0.
6110 IF(L.GT.1) GO TO 660
6120 IF(SIMP.GT..5)GO TO 180
6130 DO 50 I=1,NM
6140 IF(IIM.EQ.IME) GO TO 560
6150 H0(I)=.0254*H0(I)
6160 H1(I)=.0254*H1(I)
6170 H3(I)=.0254*H3(I)
6180 RA(I)=.0254*RA(I)
6190 X(I)=.0254*X(I)
6200 Y(I)=.0254*Y(I)
6210 Z(I)=.0254*Z(I)
6220 560 ABV=AV(I)**2+BV(I)**2
6230 IF(ABV.LT.1.E-20) GO TO 50
6240 KK=KK+1

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6250 KF=I
6260 50 CONTINUE
6270 180 II2=0
6280 DO 182 I=1,NN
6290 IF(BZ(I)*BZ(I).GT.1.E-10) II2=1
6300 182 CONTINUE
6310*
6320*   ***WRITE OUTPUT IN FILE 01
6330*
6340 WRITE(01,250) NB,NN,KW,II2,GP,CL
6350 WRITE(01,252) (H0(I),I=1,NN)
6360 WRITE(01,254) (RA(I),I=1,NN)
6370 WRITE(01,252) (X(I),I=1,NN)
6380 WRITE(01,252) (Y(I),I=1,NN)
6390 WRITE(01,252) (Z(I),I=1,NN)
6400 IF(II2.NE.0) WRITE(01,256) (BZ(I),I=1,NN)
6410 42 FORMAT(4F8.1,F9.6,2F6.1)
6420 WRITE(01,258) IFP,IFT,IDE,IRG,ATHE,APHI,AINT,AINF,DPER
6430 IF(IRG.EQ.1) WRITE(01,42) GREL,TRANEL,ANTEL,DTA,BTA,DBH,APIN
6440 IF(IRG.EQ.1) WRITE(01,252) (FA(I),I=1,NB)
6450 IF(IRG.EQ.1) WRITE(01,35) NA,(ALT(I),I=1,NA)
6460 35 FORMAT(I3,(6F8.1))
6470 IF(NB.NE.0) WRITE(01,260) (IT(I),I=1,NB)
6480*
6490*   ***CALCULATE SUB-ANTENNAS PARAMETERS AND CHECK FOR POSSIBLE ERRORS
6500 660 WAVE=300./FRE
6510 MM=0;II=0
6520 DO 210 I=1,NN
6530 CC=1
6540 IF(GP.GT..5.AND.Z(I).LT.1.E-10) CC=0.
6550 IF(AUTO.LT..5) GO TO 100
6560 IF(KK.EQ.1) GO TO 60
6570 GO TO 70
6580 60 DD=(X(KF)-X(I))*2+(Y(KF)-Y(I))*2
6590 DS=SQRT(DD)
6600 BB=10
6610 A(I)=BB*.8
6620 IF(DS/WAVE.GT.2.5) A(I)=BB*.6
6630 IF(DS/WAVE.LT.1.) A(I)=BB
6640 IF(I.EQ.KF) A(I)=BB*1.5
6650 GO TO 100
6660 70 A(I)=8
6670 IF(AV(I)*AV(I).GT.1.E-10.OR.BV(I)*BV(I).GT.1.E-10) A(I)=15
6680 100 DEL=WAVE/A(I)
6690 IF(SIMP.GT..5) GO TO 120
6700 IF(DEL.LT.2.*RA(I).AND.RA(I).LE..02) GO TO 110
6710 IF(DEL.LT..7*RA(I)) GO TO 110
6720 GO TO 120
6730 110 AA=WAVE/RA(I)/2.
6740 IF(RA(I).GT..02) AA=3.*AA
6750 GO TO 140
6760 120 A0=H0(I)/DEL-CC

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6770 A1=F1(I)/DFL+1,-CC
6780 A3=H3(I)/DEL+1,-CC
6790 IO=A0;I1=A1;I3=A3;B0=I0;B1=I1;B3=I3
6800 NS(I)=IO+1;J1=I1+1;J3=I3+1
6810 IF(A0.LT.B0+.5) NS(I)=IO
6820 IF(I0.EQ.0) NS(I)=1
6830 IF(A1.LT.B1+.5.OR.J1.GT.NS(I)) J1=I1
6840 IF(I1.EQ.0) J1=1
6850 IF(A3.LT.B3+.5.OR.J3.GT.NS(I)) J3=I3
6860 IF(I3.EQ.0) J3=1
6870 IF(J1.GT.NS(I)) J1=NS(I)
6880 IF(J3.GT.NS(I)) J3=NS(I)
6890 IF(I.EQ.1) GO TO 130
6900 MM=MM+NS(I-1)
6910 130 L1(I)=MM+J1
6920 IF(I)=MM+J3
6930 IF(IF(I).EQ.L1(I)) GO TO 160
6940 GO TO 210
6950 140 PRINT 150,I,AA
6960 150 FORMAT(" **<F>** << THE",I3," TH A(I) MUST BE LESS THAN",
6970 F5.1," >>")
6980 GO TO 200
6990 160 ABV=AV(I)*AV(I)+BV(I)*BV(I)
7000 ABZ1=AZ(I)*AZ(I)+BZ(I)*BZ(I)
7010 IF(ABV.LT.1.E-20) GO TO 210
7020 IF(ABZ1.LT.1.E-20) GO TO 210
7030 PRINT 190,I
7040 190 FORMAT(" **<F>** << THE",I3," TH LOAD FEED ARE TOO CLOSE
7050 >>")
7060 200 II=II+1
7070 210 CONTINUE
7080 IF(II.NE.0) GO TO 500
7090 MM=MM+NS(NN)
7100 IF(NB.EQ.0) GO TO 192
7110 IF(LXY.EQ.0) GO TO 192
7120 MM=0
7130 NR=0
7140 K=0
7150 DO 195 I=1,NB
7160 NX=1
7170 KX=0
7180 IF(IT(I).EQ.1097) NX=5
7190 IF(IT(I).EQ.197) NX=26
7200 IF(NX.EQ.26.AND.IV(L).EQ.I) KX=1
7210 DO 195 J=1,NX
7220 K=K+1
7230 IF(KX.EQ.1.AND.J.GT.3.AND.J.NE.15) GO TO 193
7240 MM=MM+NS(K)
7250 GO TO 194
7260 193 NR=NR+NS(K)
7270 194 L1(K)=L1(K)-NR
7280 IF(K)=IF(K)-NR

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7290 195 CONTINUE
7300 192 IF(MM.LE.MAXS) GO TO 220
7310 PRINT 215,MM
7320 215 FORMAT(" **<F>**  << NO. OF SEGMENTS", IS," ARE TOO BIG >>")
7330 GO TO 500
7340 220 K=0
7350 IF(CL.LT..5) GO TO 600
7360 NZ=0
7370 DO 410 I=1,NB
7380 NM=1
7390 IF(IT(I).EQ.1097) NM=5
7400 IF(IT(I).EQ.197) NM=26
7410 DO 408 J=1,NM
7420 K=K+1
7430 IF(J.EQ.5) GO TO 408
7440 IF(IT(I).EQ.1000) GO TO 408
7450 IF(NM.EQ.26.AND.J.NE.2) GO TO 408
7460 NZ=NZ+1
7470 IZ(NZ)=IF(K)
7480 408 CONTINUE
7490 410 CONTINUE
7500 600 IF(MM.GT.MX) MX=MM
7510 II4=0,II6=0
7520 DO 184 I=1,NN
7530 IF(BV(I)*BV(I).GT.1.E-10) II4=1
7540 IF(AZ(I).GT.1.E-10) II6=1
7550 184 CONTINUE
7560*
7570*   ***WRITE REMAINING DATA IN FILE 01
7580 WRITE(01,40) MM,NZ,IV(L),II4,II6,PR(L)
7590 WRITE(01,252) (AV(I),I=1,NN)
7600 IF(II4.NE.0) WRITE(01,252) (BV(I),I=1,NN)
7610 IF(II6.NE.0) WRITE(01,256) (AZ(I),I=1,NN)
7620 WRITE(01,260) (NS(I),I=1,NN)
7630 WRITE(01,260) (L1(I),I=1,NN)
7640 WRITE(01,260) (IF(I),I=1,NN)
7650 IF(CL.GT..5) WRITE(01,260) (IZ(I),I=1,NZ)
7660 40 FORMAT(3I4,2I3,F7.2)
7670 456 CONTINUE
7680*   ***CALCULATE MAX CORE MAXK,MAX TIME MAXTIM
7690*
7700 MAXK=1018+MX**2*2/1024 +10
7710 MAXTIM=150
7720*
7730*   ***READ RUN #, NORUN FROM 03
7740*   ***INCREMENT RUN # BY 1, WRITE INTO 03
7750*
7760 PRINT:"DATA CORRECT ?"
7770 READ 1303,I;1303 FORMAT(A1)
7780 IF(I.NE.IY) RETURN
7790 READ(03) NORUN
7800 NORUN=NORUN+1

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7810 REWIND 03
7820 WRITE(03)NORUN
7830 REWIND 03
7840 CALL DETACH(03,ISTAT,)
7850*
7860*   ***WRITE THE PROPER CONTROL CARDS IN FILE 02
7870*
7880 WRITE(02,1301) MAXTIM,MAXK,NORUN
7890 1301 FORMAT("S;LIMITS:",I2,"",I3,"K,,20K"/"S:PRMFL:02,W,S,BLA00001/",
7900&"DISTRT/",I4)
7910 IF (IRG,LE,0)GO TO 1440
7920 WRITE(02,1308)FILENAME
7930 1308 FORMAT("S:PRMFL:03,R/W,R,BLA00001/RADIO/",A8)
7940 1440 REWIND 02
7950*
7960*   ***PRINT RUN INFORMATION
7970*
7980 PRINT 1302,NORUN,MX,MAXTIM,MAXK
7990 1302 FORMAT(1X,"PROGRAM EXECUTION NUMBER-",I4/1X,"ARRAY DIMENSIONS ="
8000& I3/1X,"JOB REQUIRES ",I2,"/100 HR TIME AND ",I3,"K WORDS CORE,")
8010*
8020*   ***REWIND FILES 01,02, THEN CLOSE FILES
8030*
8040 REWIND 01;REWIND 02;CALL FCLOSE(01);CALL FCLOSE(02)
8050*
8060*   ***CREATE OUTPUT FILE /DISTRT/(NORUN )
8070*
8080 ENCODE(A,1304)NORUN,13,NORUN,13
8090 1304 FORMAT("ACCE CF,BLA00001/DISTRT/",I4,"",B/1,100/,W,CLEAR",
8100&A1,2X,"REMO ",I4,A1)
8110*
8120*   ***REMOVE FILE /DISTRT/(NORUN )
8130*   ***SPAWN CARDIN PROGRAM
8140*
8150 CALL CALLTS("ACCE",A,46)
8160 CALL CALLTS("REMO",A(13),10)
8170 CALL CALLTS("CDIN","RUN BLA00001/RADIO/SA,RUN1,R",30)
8180 500 RETURN;END
8190$   FORTRAN ASCII,NFORM,NLNO
8200 COMMON /LBLCOM/ GH,GV,SIZE,SPACE,LOC,ANGLE,LENG,TEXT
8210 REAL GH,GV,SIZE,SPACE,LOC(2),ANGLE
8220 INTEGER LENG(10)
8230 CHARACTER TEXT*1(72,10)
8240 DATA GH,GV/3.5,5./,LENG(1),LENG(2)/7.0/
8250 CHARACTER NORUN*4,LINE*26,PTYPE*1,ISO*1,STYPE*1,STOP*1
8260 INTEGER ISTAT,IOK/0400000000000000/,IRUN,RTYPE,RSIZE,NRUN,RTYPE1,I,J
8270 REAL AAMAX(3,10),AMAX(3,10),RCRD(4),A
8280 LOC(1)=0.25; LOC(2)=4.75
8290*
8300*   ***REQUEST PROGRAM EXECUTION NUMBER
8310*
8320 10 PRINT 2000

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DSTRTP



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8330 READ 1000,NORUN
8340 IF(NORUN.EQ." ") STOP
8350 ENCODE(LINF,6000) NORUN
8360 CALL ATTACH(01,LINE,1,0,ISTAT,)
8370 IF(ISTAT.NE.IOK) GO TO 300
8380 DO 20 I=1,10
8390 AAMAX(1,I)=0.
8400 20 AAMAX(2,I)=0.
8410 PTYPE=" "
8420*
8430*   ***ADJUST PAPER
8440*
8450 PRINT 2010
8460 READ 1020,LINE
8470 REWIND 01
8480 IRUN=0
8490 PRINT 2020,NORUN
8500*
8510*   ***READ RUN INFORMATION HEADINGS FROM FILE 01
8520*
8530 30 READ(01,END=80) RTYPE,RSIZE,(RCRD(I),I=1,RSIZE)
8540 IF(RTYPE.LE.0.OR.RTYPE.GT.5) GO TO 301
8550 GO TO(40,50,30,60,70),RTYPE
8560 40 IF(RSIZE.NE.2.AND.RSIZE.NE.3) GO TO 302
8570 IRUN=IRUN+1
8580 PRINT 2030,IRUN,(RCRD(I),I=1,RSIZE)
8590 GO TO 30
8600 50 IF(RSIZE.NE.3) GO TO 302
8610 IF(IRUN.EQ.0) IRUN=1
8620 PRINT 2040,(RCRD(I),I=1,3)
8630 AAMAX(J,IRUN)=RCRD(2)
8640 GO TO 30
8650 60 IF(RSIZE.NE.1) GO TO 302
8660 PRINT 2050,RCRD(1)
8670 J=1
8680 GO TO 30
8690 70 IF(RSIZE.NE.1) GO TO 302
8700 PRINT 2060,RCRD(1)
8710 J=2
8720 GO TO 30
8730 80 PRINT 2070
8740 100 REWIND 01
8750 IRUN=1
8760*
8770*   ***REQUEST RUN NUMBER ,NRUN
8780*
8790 PRINT 2080
8800 READ 1010,NRUN
8810*
8820*   ***READ RUN DATA FROM FILE 01
8830*
8840 110 READ(01,END=303) RTYPE

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8850 IF(RTYPE,EQ.1.AND.IRUN,EQ.NRUN) GO TO 130
8860 IF(IRUN,EQ.1.AND.RTYPE,NE.1) GO TO 120
8870 IF(RTYPE,NE.1) GO TO 110
8880 IRUN=IRUN+1
8890 GO TO 110
8900 120 BACKSPACE 01
8910 130 PRINT 2090
8920*
8930*   ***REQUEST PLOT TYPE(V,H, B, OR *)
8940*
8950 READ 1020,LINE
8960 IF(LINE,NE,"") PTYPE=LINE
8970 IF(PTYPE,NE,"V",AND.PTYPE,NE,"H",AND.PTYPE,NE,"B") GO TO 130
8980 IF (PTYPE,NE,"V")GO TO 66;IF(AAMAX(1,NRUN).EQ.0.)GO TO 130;GO TO 67
8990 66 IF(PTYPE,NE,"H")GO TO 68;IF(AAMAX(2,NRUN).EQ.0.)GO TO 130;GO TO 67
9000 68 IF((AAMAX(1,NRUN).EQ.0.).OR.(AAMAX(2,NRUN).EQ.0.)) GO TO 130
9010 67 CONTINUE
9020*
9030*   ***REQUEST IF ISOTROPIC CIRCLE(ISO) DESIRED
9040*
9050 PRINT 2100 ;READ 1020,ISO
9060 IF(LINE,EQ,"") GO TO 195
9070*
9080*   ***REQUEST FORMAT OF PLOT DESIRED( S,H,F),STYPE
9090*
9100 140 PRINT 2110
9110 READ 1020,STYPE
9120 IF(STYPE,NE,"S",AND.STYPE,NE,"H",AND.STYPE,NE,"F") GO TO 140
9130 IF(STYPE,NE,"F") GO TO 160
9140 A=1.
9150*   ***CALCULATE THE FACTORS FOR SCALED ,NORMALIZED
9160*   *** OR FAMILY PLOTS
9170*
9180 DO 150 I=1,10
9190 IF(PTYPE,NE,"H") A=AMAX1(A,AAMAX(1,I))
9200 IF(PTYPE,NE,"V") A=AMAX1(A,AAMAX(2,I))
9210 150 CONTINUE
9220 A=SQRT(A)
9230 151 DO 155 I=1,10
9240 IF(STYPE,EQ,"S") A=SQRT(AMAX1(AAMAX(1,I),AAMAX(2,I),1.))
9250 AMAX(1,I)=SQRT(AAMAX(1,I))/A
9260 AMAX(2,I)=SQRT(AAMAX(2,I))/A
9270 155 AMAX(3,I)=1./A
9280 GO TO 190
9290 160 IF(STYPE,EQ,"S") GO TO 151
9300 LINE=PTYPE
9310 IF(PTYPE,NE,"B") GO TO 170
9320 IF(ISO,EQ,"Y") GO TO 165
9330 J=2
9340 GO TO 175
9350 165 PRINT 2120
9360 READ 1020,LINE

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9370 170 J=1
9380 IF(LINE.EQ."H") J=2
9390 IF(J.EQ.1.AND.LINE.NE."V") GO TO 165
9400 175 DO 180 I=1,10
9410 AMAX(1,I)=1.
9420 AMAX(2,I)=1.
9430 A=SQRT(AMAX1(AAMAX(J,I),1.))
9440 180 AMAX(3,I)=1./A
9450*
9460*   ***REQUEST IF STOP BETWEEN PLOTS
9470*
9480 190 PRINT 2130
9490 READ 1020,STOP
9500*
9510*   ***READY THE PLOTTER
9520*
9530 195 PRINT 2140
9540 200 READ 1020,LINE
9550 205 READ(01,END=304) RTYPE1
9560 IF(PTYPE.EQ."H".AND.RTYPE1.NE.5) GO TO 205
9570 210 READ(01,END=304) A
9580*
9590*   ***PLTL:ENABLE PLOTTER
9600*
9610 PRINT 2150
9620 J=1
9630 IF(RTYPE1.EQ.5) J=2
9640 A=AMAX(J,NRUN)
9650*
9660*   ***READ : RADIATION PATTERN DATA FROM FILE 01
9670*
9680 220 READ(01,END=305) RTYPE,RSIZE,(RCRD(I),I=1,RSIZE)
9690 IF(RTYPE.NE.3) GO TO 230
9700 IF(RSIZE.LT.2.OR,RSIZE.GT.4) GO TO 306
9710*
9720*   ***CALCULATE PEN POSITIONS TO PLOT RADIATION PATTERN
9730*
9740 CALL PPLLOT(J,RCRD,A)
9750 GO TO 220
9760 230 IF(RTYPE.NE.5.OR,PTYPE.EQ."V") GO TO 240
9770 RTYPE1=RTYPE
9780 IF(STOP.NE."Y") GO TO 210
9790*
9800*   ***PLTT: TERMINATE PLOT
9810*   ***CHANGE PEN ?
9820*
9830 PRINT 2170
9840 READ 1020,LINE
9850 GO TO 210
9860 240 IF(ISO.NE."Y") GO TO 260
9870 IF(STOP.NE."Y") GO TO 245
9880 PRINT 2170

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9890 READ 1020,LINE
9900*
9910*   ***CALCULATE & PRINT THE DATA POINTS X,Y OF ISOTROPIC CIRCLE
9920*
9930 245 PRINT 2180
9940 RCRD(2)=1.
9950 A=AMAX(3,NRUN)
9960 DO 250 I=1,8
9970 DO 250 J=1,3
9980 RCRD(1)=45*I+2*J-4
9990 250 IF(J.EQ.2.OR.MOD(I,2).EQ.0) CALL PLOT(2,RCRD,A)
10000*
10010*   ***LABEL EACH PLOTTING
10020 260 ENCODE(LINE,6020) NORUN,NRUN+100
10030 CALL UNPACK(LINE,1,TEXT,1,7)
10040 CALL LABEL(-1)
10050*
10060*   ***ANOTHER PLOT FROM THIS FILE ?
10070*
10080 PRINT 2200
10090 READ 1020,LINE
10100 IF(LINE.EQ."Y") GO TO 100
10110 REWIND 01
10120 CALL DETACH(01,ISTAT,)
10130*
10140*   ***RELEASE PLOTTER FILE ?
10150*
10160 PRINT 2210
10170 READ 1020,LINE
10180 IF(LINE.NE."Y") GO TO 10
10190 ENCODE(LINE,6010) NORUN,13
10200*
10210*   ***RELEASE THE PLOTTER FILE
10220*
10230 CALL CALLTS("RELE",LINE,26)
10240 GO TO 10
10250 300 PRINT 3000,ISTAT; STOP
10260 301 PRINT 3001,RTYPE; STOP
10270 302 PRINT 3002,RSIZE; STOP
10280 303 PRINT 3003,NRUN; GO TO 100
10290 304 PRINT 3004; STOP
10300 305 RTYPE=0; GO TO 230
10310 306 PRINT 3006; GO TO 302
10320 1000 FORMAT(A4)
10330 1010 FORMAT(V)
10340 1020 FORMAT(A1)
10350 2000 FORMAT(" PROGRAM TO PLOT OUTPUT FROM DISTORT"/
" ENTER PROGRAM EXECUTION NUMBER")
10360*
10370 2010 FORMAT(" ADJUST PAPER")
10380 2020 FORMAT(" PROGRAM EXECUTION NUMBER-",A4)
10390 2030 FORMAT("ORUN NUMBER",I3," ANT# (FED)",I3," FREQ (MHZ)",F8,3,
10400* TYPE",I5)

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10410 2040 FORMAT(" EMAX=",F8.4," GAIN=",F7.3," GAIN(DB)=",F7.3)
10420 2050 FORMAT(" VERTICAL PATTERN, PHI =",F6.1)
10430 2060 FORMAT(" HORIZONTAL PATTERN, THETA=",F6.1)
10440 2070 FORMAT(//////)
10450 2080 FORMAT(" ENTER RUN NUMBER")
10460 2090 FORMAT(" ENTER PLOT TYPE (VER, HOR, BOTH, OR *)")
10470 2100 FORMAT(" PLOT ISOTROPIC CIRCLE?")
10480 2110 FORMAT(" ENTER TYPE OF PLOT DESIRED: SCALED, NORMALIZED, OR ",
10490 "FAMILY")
10500 2120 FORMAT(" ISOTROPIC CIRCLE RELATIVE TO VER OR HOR PLOT?")
10510 2130 FORMAT(" STOP BETWEEN PLOTS?")
10520 2140 FORMAT(" READY THE PLOTTER")
10530 2150 FORMAT(10X,"PLTL")
10540 2170 FORMAT(10X,"PLTT"/" CHANGE PENS")
10550 2180 FORMAT(10X,"PLTP")
10560 2200 FORMAT(10X,"PLTT"/" ANOTHER PLOT FROM THIS FILE?")
10570 2210 FORMAT(" RELEASE PLOTTER FILE?")
10580 3000 FORMAT(" FILE ACCESS ERROR, STATUS =",O13)
10590 3001 FORMAT(" ILLEGAL RECORD TYPE =",I12)
10600 3002 FORMAT(" ILLEGAL RECORD SIZE =",I12)
10610 3003 FORMAT(" RUN NUMBER",I12," NOT FOUND")
10620 3004 FORMAT(10X,"PLTT"/" UNEXPECTED END OF FILE")
10630 3006 FORMAT(10X,"PLTT")
10640 6000 FORMAT("BLA00001/DISTR1/",A4,";")
10650 6010 FORMAT("RELE BLA00001/DISTR1/",A4,A1)
10660 6020 FORMAT(A4,"-",I2)
10670 END
10680$      FORTRAN ASCII,NFORM,NLNO
10690$
10700$      ***SUBROUTINE PLOT-CALCULATE X,Y COORDINATES OF PEN POSITIONS
10710$      ***                      AND PLOT
10720$
10730 SUBROUTINE PLOT(J,RCRD,A)
10740 REAL RCRD(2)
10750 ANGRAD=RCRD(1)*3.14159/180.
10760 R=RCRD(2)*5000.*A
10770 IX=R*SIN(ANGRAD)
10780 IY=R*COS(ANGRAD)*.7
10790 GO TO (10,20),J
10800 10 IX=IX+5000
10810 IY=IY+5000
10820 GO TO 30
10830 20 IX=-IX+5000
10840 IY=IY+5000
10850 30 PRINT 1000,IX,IY
10860 RETURN
10870 1000 FORMAT(10X,I4,1X,I4)
10880 END
10890$      FORTRAN ASCII,NFORM,NLNO
10900 SUBROUTINE LABEL(INPTFILE)
10910$*****PROGRAM: LABEL - GENERATES ALPHANUMERICS ON
10920$      HP MODEL 7200A/7202A GRAPHIC PLOTTER

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DSTR1

Y.LABL

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10930*
10940 COMMON /LBLCOM/ GH,GV,SIZE,SPACE,LOC,ANGLE,LENG,TEXT
10950 INTEGER INPTFILE,COMPFILE/41/,ALPHANUM/40/,LENG(10),IOK/04000000000000
10960 REAL LOC(2),LIMPNT,KAPPNT,MAG
10970 CHARACTER*1 TEXT(72,10)
10980 LOGICAL PENUP
10990 CHARACTER ANS*1,BLANK*1/1H /
11000 DIMENSION INPUT(5),KPOINT(41)
11010 DATA SIZE,SPACE,LOC,ANGLE/0.,50.,0.,0.,0./
11020*
11030*****GET ALPHANUMERIC PLOTTING POINTS
11040*
11050 CALL ATTACH(40,"BLA00001/PLOTTER/ALPHANUM;",1,1,ISTAT,)
11060 IF(ISTAT.EQ.IOK) GO TO 5; PRINT 901, ISTAT; GO TO 190
11070 5 CALL RANSIZ(40,41,1)
11080*
11090*** SKIP ASKING FOR INST IF USING FILE INPUT
11100*
11110 IF(INPTFILE.EQ.-1) GO TO 105
11120 IF(INPTFILE.LT.1.OR.INPTFILE.GT.39) INPTFILE=41
11130 IF(INPTFILE.NE.COMPFILE) GO TO 10
11140*
11150*****ASK IF INSTRUCTIONS ARE NEEDED
11160*
11170 PRINT:"INSTRUCTIONS ?"
11180 READ 900,ANS
11190 IF(ANS.NE."Y")GO TO 11
11200*
11210*****PRINT INSTRUCTIONS
11220*
11230 PRINT 990
11240 PRINT 991
11250*
11260*****GET WIDTH AND HEIGHT OF GRAPH
11270*
11280 11 PRINT:"INPUT FROM FILE ?"
11290 READ 900,ANS
11300 IF(ANS.EQ."N")GOTO 10
11310 IF(ANS.NE."Y")GOTO 11
11320 PRINT:"FILE NUMBER ?"
11330 READ:INPTFILE
11340 10 IF(INPTFILE.EQ.COMPFILE)PRINT:"GRAPH SIZE IN MAJOR GRID DIVISIONS:"
11350 IF(INPTFILE.EQ.COMPFILE)PRINT:"WIDTH"
11360 READ(INPTFILE,119,END=1313)GH
11370 119 FORMAT(V)
11380 IF(INPTFILE.EQ.COMPFILE)PRINT:"HEIGHT"
11390 READ(INPTFILE,119,END=1313)GV
11400*
11410*****GET INPUTS
11420*
11430 IF(INPTFILE.EQ.COMPFILE)PRINT:"INPUTS DESIRED:"
11440 IF(INPTFILE.EQ.COMPFILE)PRINT:

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114508 "1=TEXT,2=SIZE,3=SPACING,4=LOCATION,5=ANGLE(12345 FOR ALL)"
11460 20 READ(INPTFILE,902,END=1313)INPUT
11470 DO 40 I=1,5
11480 INPUTI=INPUT(I)+1
11490 IF(INPUTI.LT.1.OR.INPUTI.GT.5) GO TO 1313
11500 GO TO (100,50,60,70,80,90),INPUTI
11510 50 IF(INPTFILE.EQ.COMPPFILE)PRINT:"TEXT:"
11520 DO 55 J=1,10
11530 READ(INPTFILE,903,END=1313)(TEXT(K,J),K=1,72)
11540 LENG(J)=0
11550 DO 53 K=1,72
11560 53 IF(TEXT(K,J).NE.BLANK) LENG(J)=K
11570 IF(LENG(J).EQ.0) GO TO 40
11580 55 CONTINUE
11590 GO TO 40
11600 60 IF(INPTFILE.EQ.COMPPFILE)PRINT:"SIZE"
11610 READ(INPTFILE,119,END=1313)SIZE
11620 GO TO 40
11630 70 IF(INPTFILE.EQ.COMPPFILE)PRINT:"SPACING (X)"
11640 READ(INPTFILE,119,END=1313)SPACE
11650 GO TO 40
11660 80 IF(INPTFILE.EQ.COMPPFILE)PRINT:"LOCATION (X,Y)"
11670 READ(INPTFILE,119,END=1313)LOC(1),LOC(2)
11680 GO TO 40
11690 90 IF(INPTFILE.EQ.COMPPFILE)PRINT:"ANGLE"
11700 READ(INPTFILE,119,END=1313)ANGLE
11710 40 CONTINUE
11720 100 IF(INPTFILE.EQ.COMPPFILE)PRINT:"DO YOU WANT TO RE-ENTER ANY INPUTS"
11730 READ(INPTFILE,900,END=1313)ANS
11740 IF(ANS.EQ."Y")GO TO 185
11750*
11760*****BEGIN CALCULATIONS FOR PLOT
11770*
11780 105 SCALE=SIZE*9999./{60.*GV}
11790 SPAYS=40.*ABS(SCALE)*{1.+SPACE/100.}
11800 XLOC=LOC(1)*9999./GH
11810 YLOC=LOC(2)*9999./GV
11820 ROT=ANGLE*3.1415927/180.
11830 LINPNT=0.
11840*
11850*****ACTIVATE PLOTTER
11860*
11870 PRINT:"          PLTL"
11880 DO 170 LINE=1,10
11890 LENGTH=LENG(LINE)
11900 IF(LENGTH.EQ.0)GO TO 180
11910 KARFNT=0.
11920 DO 160 KN=1,LENGTH
11930*
11940*****GET CHARACTER TO BE PLOTTED
11950*
11960 KAR=FLD(0,9,TEXT(KN,LINE))

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11970 IF(KAR.EQ.32) GO TO 150
11980 IF(KAR.LT.33.OR.KAR.GT.126) GO TO 160
11990 KAR=KAR-31
12000 READ(ALPHANUM,KAR)KPOINT
12010 PENUP=.TRUE.
12020 NK=KPOINT(1)*2
12030 DO 140 KOR=2,NK,2
12040 IF(KPOINT(KOR).NE.(-1))GO TO 110
12050 PENUP=.TRUE.
12060 GO TO 140
12070*
12080*****SCALE POINT COORDINATES
12090*
12100 110 X=FLOAT(KPOINT(KOR))*ABS(SCALE)+KARPNT
12110 Y=FLOAT(KPOINT(KOR+1))*SCALE+LIPNT
12120 MAG=SQRT(X*X+Y*Y)
12130 IF(MAG.EQ.0.)X=1.
12140 DIR=ATAN2(Y,X)
12150 ANG=DIR+ROT
12160 IH=MAG*COS(ANG)*GV/GH+XLOC
12170 IV=MAG*SIN(ANG)+YLOC
12180 IF(IH.GT.9999.OR.IH.LT.0)GO TO 165
12190 IF(IV.GT.9999.OR.IV.LT.0)GO TO 165
12200*
12210*****PLOT POINT
12220*
12230 IF(PENUP)GO TO 120
12240 PRINT 904,IH,IV
12250 GO TO 130
12260 120 PRINT 905,IH,IV
12270 130 PENUP=.FALSE.
12280 140 CONTINUE
12290*
12300*****INCREMENT CHARACTER POINTER
12310*
12320 150 KARPNT=KARPNT+SPAYS
12330 160 CONTINUE
12340*
12350*****INCREMENT LINE POINTER
12360*
12370 165 LIPNT=LIPNT-90.*SCALE
12380 170 CONTINUE
12390*
12400*****DEACTIVATE PLOTTER
12410*
12420 180 PRINT:"          PLTT"
12430 IF(INPTFILE.EQ.-1) GO TO 190
12440*
12450*****ASK IF MORE INPUTS ARE DESIRED
12460*
12470 IF(INPTFILE.EQ.COMPFILE)PRINT:"MORE"
12480 READ(INPTFILE,900,END=1313)ANS

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12490 IF(ANS.NE."Y")GO TO 190
12500*
12510****GET MORE INPUTS
12520*
12530 185 IF(INPTFILE.EQ.COMPFILE)PRINT:"INPUTS DESIRED (12345)"
12540 GO TO 20
12550*
12560****CLOSE DOWN
12570*
12580 1313 PRINT:"LABEL PROGRAM ABORTED-IMPROPER USE OF FILE INPUT"
12590 190 CALL DETACH(40,ISTAT,)
12600 RETURN
12610 900 FORMAT(A1)
12620 901 FORMAT(10X,"PLTT"/" UNABLE TO ACCESS FILE ALPHANUM, STATUS ",012)
12630 902 FORMAT(5I1)
12640 903 FORMAT(72A1)
12650 904 FORMAT(10X,I4,1X,I4)
12660 905 FORMAT(10X,I4,1X,I4,1H")
12670 990 FORMAT(
126808"OLABEL GENERATES ALPHANUMERICS ON HP MODEL 7200A/7202A
126908"GRAPHIC PLOTTER.",/,
127008"OYOU WILL BE ASKED FOR INPUTS:",/,
127108"O1=TEXT,2=SIZE,3=SPACING,4=LOCATION,5=ANGLE(12345 FOR ALL):",/,
127208"OANY COMBINATION OF THE FIVE NUMBERS MAY BE USED.",/,
127308" SUCH AS 14 FOR TEXT AND LOCATION ONLY.",/,
127408"OTEXT IS THE TEXT YOU WISH PRINTED, UP TO 72 CHARACTERS PER LINE.",/,
127508" A REQUEST FOR MORE INPUT IS GENERATED AFTER EACH LINE ENTRY.",/,
127608" TO TERMINATE REQUESTS FOR MORE INPUT, ENTER A BLANK LINE.",/,
127708" UP TO 10 LINES MAY BE ENTERED AT A TIME.")
12780 991 FORMAT(
127908"OSIZE IS THE HEIGHT OF EACH LETTER IN MAJOR GRID DIVISIONS.",/,
128008" SIZE IS SET AT 0.1 IF YOU DO NOT CHANGE IT.",/,
128108"OSPACING IS THE SPACE BETWEEN LETTERS IN X OF A LETTER",/,
128208" WIDTH, LETTER WIDTH IS 2/3 OF LETTER HEIGHT. SPACING IS",/,
128308" SET AT 50 IF YOU DO NOT CHANGE IT.",/,
128408"OLOCATION IS THE POSITION ON THE GRAPH IN MAJOR GRID",/,
128508" DIVISIONS, MEASURED FROM THE LOWER LEFT OF THE GRAPH. TWO",/,
128608" NUMBERS ARE REQUIRED, FIRST THE HORIZONTAL POSITION, THEN",/,
128708" THE VERTICAL POSITION. LOCATION IS SET AT 0,0 IF YOU DO NOT",/,
128808" CHANGE IT.",/,
128908"OANGLE IS THE ANGLE IN DEGREES FROM THE HORIZONTAL. ANGLE",/,
129008" IS SET AT 0 IF YOU DO NOT CHANGE IT.",/,
129108"OPARAMETERS ARE NOT RESET AUTOMATICALLY. THEY WILL RETAIN",/,
129208" THE LAST VALUE INPUT.",/,"0")
12930 END
129408
12950      GMAP
12960      LBL      YSFUTL00, SERIES 6000 TSS FORTRAN UTILITY PACKAGE
12970      TTL      YSFUTL, SERIES 6000 TSS FORTRAN UTILITY PACKAGE
12980      TTLS     SDL 4.0
12990      PMC      ON
13000      EDITP    ON
          DETAIL  OFF
          YSFUTL

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13010      REF      LNRSN,ON
13020      REFMA    ON
13030      LODM     .G3TSM          DEFINE TSS SYSTEM MACROS
13040      PMC      OFF
13050      TRA      710200          TRA OF CODE
13060      STUFF    MACRO          REGISTER,LOCATIONS
13070      IDRP     #2
13080      ST#1     #2,$          STUFF IT!
13090      IDRP
13100      ENDM     STUFF          THAT WAS SIMPLE, WASN'T IT?
13110      .PZER.   NULL          THIS IS THE ORIGIN FOR THIS PROGRAM
13120      BCI      1,740621       VERSION DATE
13130      DATE
13140      .SSDRL
13150      REM
13160      REM
13170      REM          THIS UTILITY PACKAGE IS DESIGNED TO BE USED AS
13180      REM          A SUBROUTINE BY TSS FORTRAN PROGRAMS. IT PERFORMS
13190      REM          MISCELLANEOUS WORTHWHILE(?) FUNCTIONS WHICH ARE
13200      REM          DIFFICULT OR IMPOSSIBLE TO PULL OFF WITHOUT THE
13210      REM          AID OF SUCH A SUBROUTINE. THERE ARE EIGHT ENTRY
13220      REM          POINTS TO THIS ROUTINE, THE CHARACTERISTICS OF
13230      REM          WHICH ARE DESCRIBED BELOW --
13240      REM
13250      REM          CALL FLGBRK(FLAG)
13260      REM
13270      REM          WHERE FLAG IS A LOGICAL VARIABLE, WILL ALLOW
13280      REM          RECOVERY FROM BREAKS DURING EXECUTION. WHEN
13290      REM          FLGBRK IS CALLED, FLAG WILL BE SET TO THE LOGICAL
13300      REM          VALUE .FALSE,; IF A BREAK OCCURS SUBSEQUENTLY,
13310      REM          IT WILL BE IGNORED AND EXECUTION CONTINUED, BUT
13320      REM          THE LOGICAL VARIABLE FLAG WILL BE SET TO .TRUE,
13330      REM          TO INDICATE RECOGNITION OF A BREAK. THIS FLAG MAY
13340      REM          BE TESTED BY THE CALLING ROUTINE AT ANY TIME,
13350      REM          AND ANY APPROPRIATE ACTION TAKEN. TO PROTECT
13360      REM          THE USER AGAINST INFINITE LOOPS, HOWEVER, BREAKS
13370      REM          ARE COUNTED AS THEY ARE RECEIVED; IF TWENTY OR MORE
13380      REM          BREAKS ARE RECOGNIZED, EXECUTION IS TEMPORARILY
13390      REM          SUSPENDED AND THE FOLLOWING MESSAGE APPEARS --
13400      REM
13410      REM          *BREAK: STOP OR CONTINUE?
13420      REM
13430      REM          AT THIS POINT THE USER MAY ENTER ANY OF THREE
13440      REM          RESPONSES:
13450      REM
13460      REM          S    WILL IMMEDIATELY TERMINATE THE PROGRAM
13470      REM          A    WILL TERMINATE THE PROGRAM WITH A DRL ABORT
13480      REM          C    WILL RESET COUNTERS AND CONTINUE EXECUTION
13490      REM
13500      REM          NOTE: THE DRL ABORT ALLOWS DUMPING THE SUBSYSTEM
13510      REM          TO A FILE FOR DEBUGGING PURPOSES.
13520      REM

```

13530	REM	CALL BRKOFF
13540	REM	
13550	REM	CALLING THIS ENTRY POINT NULLIFIES THE EFFECTS OF A
13560	REM	PREVIOUS CALL TO FLGBRK,
13570	REM	
13580	REM	CALL KEYOT
13590	REM	
13600	REM	CALLING THIS ENTRY POINT WILL FORCE ANY OUTPUT
13610	REM	ACCUMULATED BY THE SUBSYSTEM TO BE OUTPUT. THIS
13620	REM	IS OF SIGNIFICANCE WHENEVER SMALL AMOUNTS OF OUTPUT
13630	REM	ARE BEING GENERATED, WITH EXTENDED PROCESSING
13640	REM	INTERVENING; IF THIS FUNCTION IS NOT USED IN
13650	REM	SUCH A CASE, THE OUTPUT WILL NOT BE PRINTED UNTIL
13660	REM	THE EXECUTIVE'S BUFFER FILLS, OR INPUT IS REQUESTED,
13670	REM	EITHER OF WHICH MIGHT NOT OCCUR FOR A LONG TIME.
13680	REM	
13690	REM	CALL KEYIN(BUFF,N)
13700	REM	
13710	REM	THIS ENTRY POINT ALLOWS THE USER TO RETRIEVE THE LAST
13720	REM	LINE OF INPUT SO LONG AS IT REMAINS AVAILABLE,
13730	REM	THUS IT EFFECTIVELY FUNCTIONS AS A BACKSPACE COMMAND
13740	REM	FOR THE TELETYPE. THE INPUT IS PLACED IN THE
13750	REM	ARRAY, BUFF, IN 21A4 FORMAT. N IS AN INTEGER VARIABLE
13760	REM	INTO WHICH WILL BE PLACED THE NUMBER OF CHARACTERS
13770	REM	TRANSMITTED. NOTE THAT N MAY BE ZERO, INDICATING THAT
13780	REM	THE DATA IS NO LONGER AVAILABLE DUE TO INTERVENING
13790	REM	OUTPUT. THE DATA PLACED IN BUFF IS NOT EDITED OR BLANK
13800	REM	FILLED IN ANY WAY, AND WILL INCLUDE A CARRIAGE RETURN
13810	REM	CHARACTER AT THE END OF THE LINE. N INCLUDES THE
13820	REM	CARRIAGE RETURN.
13830	REM	
13840	REM	CALL CALLTS(SSNAME,LINE,NCHAR)
13850	REM	
13860	REM	THIS ENTRY POINT ALLOWS THE USER TO PLACE DATA IN THE
13870	REM	KIN BUFFER, OR CALL ANOTHER TSS SUBSYSTEM, OR
13880	REM	BOTH. IF A SUBSYSTEM IS TO BE CALLED, THE FIRST
13890	REM	FOUR CHARACTERS OF THE SUBSYSTEM NAME SHOULD
13900	REM	BE PLACED IN THE ASCII VARIABLE, SSNAME. IF
13910	REM	SSNAME CONTAINS ALL BLANKS OR IS AN INTEGER ZERO, THE
13920	REM	SUBSYSTEM CALL WILL BE BYPASSED. IF DATA IS TO BE
13930	REM	PLACED IN THE KIN BUFFER, THE COUNT OF CHARACTERS TO
13940	REM	BE MOVED SHOULD BE PLACED IN THE INTEGER VARIABLE
13950	REM	NCHAR, AND THE ASCII ARRAY, LINE, SHOULD CONTAIN
13960	REM	THE DATA TO BE PLACED IN THE BUFFER, IN 21A4 FORMAT.
13970	REM	UP TO 81 CHARACTERS MAY BE PLACED IN THE BUFFER IN THIS
13980	REM	MANNER. IF NCHAR IS ZERO, THIS FUNCTION WILL BE
13990	REM	BYPASSED. AS AN EXAMPLE OF USAGE OF THIS FUNCTION,
14000	REM	ASSUME THE USER WISHES TO OBTAIN THE STATUS OF A
14010	REM	BATCH JOB WITH THE SNUMB, 1234T. THE COMMAND AT
14020	REM	SYSTEM LEVEL WOULD BE: JSTS 1234T<CR>.
14030	REM	THIS MAY BE ACCOMPLISHED BY THE TSS FORTRAN PROGRAM
14040	REM	BY PLACING THE SUBSYSTEM NAME(JSTS) IN SSNAME,

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14050      REM      PLACING THE COMMAND(JSTS 1234T<CR>) IN LINE,
14060      REM      AND THE CHARACTER COUNT(11) IN NCHAR, THE
14070      REM      JSTS SUBSYSTEM IS THEN CALLED TO PRODUCE THE JOB
14080      REM      STATUS MESSAGE.
14090      REM
14100      REM      CALL ULASCI(ARRAY,CPOS,NCHAR,L)
14110      REM
14120      REM      THIS ENTRY POINT IS USED TO FORCE ASCII DATA IN AN
14130      REM      ARRAY TO UPPER CASE OR LOWER CASE ASCII CODE. THIS
14140      REM      IS OCCASIONALLY USEFUL, INASMUCH AS MOST TELETYPES
14150      REM      TRANSMIT ONLY UPPER CASE, AND CERTAIN PIECES
14160      REM      OF SOFTWARE (TSS FORTRAN, FOR EXAMPLE) RECOGNIZE
14170      REM      ONLY UPPER CASE ASCII, WHEREAS LOWER CASE IS
14180      REM      SOMEWHAT EASIER TO WORK WITH AND HENCE IS REQUIRED
14190      REM      BY OTHER TIMESHARING SOFTWARE. ULASCI WILL
14200      REM      TRANSLITERATE EITHER WAY. THE DATA IN THE ASCII ARRAY,
14210      REM      ARRAY, IS ACTED UPON, STARTING AT CHARACTER POSITION
14220      REM      CPOS (INTEGER), FOR NCHAR CHARACTERS. IF L IS EVEN,
14230      REM      THE DATA WILL BE FORCED UPPER CASE; IF L IS ODD,
14240      REM      IT WILL BE FORCED LOWER CASE.
14250      REM      NOTE: THE CHARACTER POSITION, CPOS, IS
14260      REM      HANDLED IN THE SAME WAY AS IN THE STANDARD TSS
14270      REM      SUBROUTINES, GET#C, PUT#C, AND MOVE#S.
14280      REM
14290      REM      CALL BCDASC(FROM,IPOS,TO,JPOS,NCHAR,FILL)
14300      REM      CALL ASCBCD(FROM,IPOS,TO,JPOS,NCHAR,FILL)
14310      REM
14320      REM      THESE TWO ROUTINES FUNCTION AS A MOVE#S WITH
14330      REM      TRANSLITERATION AS INDICATED. IPOS AND JPOS
14340      REM      ARE STARTING CHARACTER POSITIONS IN FROM AND TO,
14350      REM      RESPECTIVELY. BEAR IN MIND THAT THERE ARE 4 ASCII
14360      REM      CHARACTERS PER WORD, AND 6 BCD CHARACTERS PER WORD.
14370      REM      FILL IS A BLANK FILL CONTROL. IF THE INTEGER VARIABLE
14380      REM      FILL IS ZERO, THE ARRAY, TO, IS NOT BLANK-FILLED;
14390      REM      IF FILL IS NONZERO, THE LAST RECEIVING WORD OF THE
14400      REM      ARRAY WILL BE BLANK-FILLED.
14410      REM      FLGBRK
14420      REM
14430      REM      FLGBRK ROUTINE--SET BREAK RECOVERY
14440      REM
14450      REM      FLGBRK SAVE      PRIMARY ENTRY POINT
14460      REM      INHIB ON      INHIBIT BREAK PROCESSING
14470      REM      BAKP,6      GET ADDRESS OF BREAK RTN.
14480      REM      TRA,DL      MAKE A TRA OUT OF IT
14490      REM      STA 13      STORE IN BREAK VECTOR
14500      REM      LDQ =02000,DU      LOAD BIT 7
14510      REM      DRL SETSWH      AND SET SWITCH WORD
14520      REM      EAA 2,1*      GET LOC OF LOG. VAR.
14530      REM      STA FLAG,4      STORE IN POINTER WORD
14540      REM      STZ FLAG,4*      ZERO THE CALLING VARIABLE
14550      REM      RETURN FLGBRK      AND RETURN TO CALLER
14560      REM      TTLS      BRKOFF

```



14570	REM		
14580	REM		
14590	REM		
14600	BRKOFF	SAVE	ENTRY TO TURN OFF BREAK RECOVERY
14610	LDO	=02000,DU	GET A BIT
14620	DRL	RSTSWH	RESET SWITCH WORD
14630	STZ	13	ZERO VECTOR
14640	STZ	FLAG,\$	AND FLAG WORD
14650	INHIB	OFF	ALL THRU MESSING WITH BREAK PROC.
14660	RETURN	BRKOFF	AND RETURN
14670	TTLs	KEYOT	
14680	REM		
14690	REM		
14700	REM		
14710	KEYOT	SAVE	KOTNOW ENTRY
14720	EAA	MSG,\$	FIND A SUBOUT
14730	ORA	64+32+3,DL	ONE CHAR IN POS 03
14740	STA	BUF,\$	STORE IN SCRATCH
14750	EAA	BUF,\$	FORM DRIVER TALLY
14760	ORA	64,DL	ONE TALLY ONLY
14770	STA	TALLY,\$	SAVE
14780	EAA	TALLY,\$	LOC OF DRIVER TALLY
14790	STA	2,IC	TO DRL SEQUENCE
14800	DRL	KOTNOW	FLUSH TSS BUFFER
14810	ZERO		
14820	RETURN	KEYOT	AND RETURN
14830	TTLs	KEYIN	
14840	REM		
14850	REM		
14860	REM		
14870	KEYIN	SAVE	ENTRY TO RETRIEVE LAST LINE
14880	EAA	2,1*	GET LOC OF BUFFER
14890	EAQ	3,1*	AND COUNT WORD
14900	ARL	18	SHIFT THEM
14910	LLS	18	INTO A SINGLE WORD
14920	EAQ	STAT,\$	SCRATCH
14930	ESTAQ	2,IC	AND STORE IN SEQUENCE
14940	DRL	KIN	GET THE LINE
14950	ZERO		
14960	ZERO		
14970	RETURN	KEYIN	AND RETURN TO CALLER
14980	TTLs	CALLTS	
14990	REM		
15000	REM		
15010	REM		
15020	CALLTS	SAVE	ENTRY TO PSEUDO & CALLSS
15030	LDA	2,1*	GET SUBSYSTEM NAME
15040	ORA	ABLNK,\$	FORCE LOWER CASE
15050	STA	SSNAME,\$	STORE IN CALLSS ARG WORD
15060	LDA	4,1*	GET # OF CHARACTERS TO PSEUDO
15070	TZF	CALTS,\$	ZERO, DON'T BOTHER
15080	ALS	6	SHIFT TO TALLY POSITION

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COMPUTER PROGRAM MAINTENANCE MANUAL FOR THE ANTENNA PATTERN DIS--ETC(U)  
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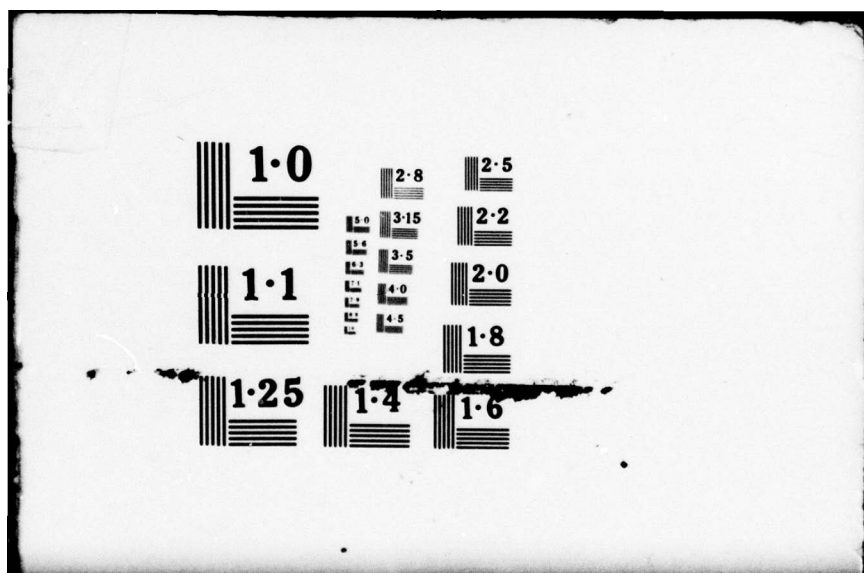
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15090	ANA	-1,DL	DROP EXTRA CRUD
15100	CHPA	82*64,DL	IS IT GREATER THAN 81?
15110	THI	2,IC	NO, O. K.
15120	LDA	81*64,DL	FORCE COUNT TO 81 CHARS
15130	ORA	32,DL	MAKE IT A TALLYB
15140	STA	TALLY,\$	STORE IN TALLY SCRATCH
15150	EAXO	3,1*	FIND DATA ADDRESS
15160	STXO	TALLY,\$	AND PLUG INTO TALLY
15170	EAA	TALLY,\$	THE TALLY IS HERE, . .
15180	EAO	STAT,\$	DUMMY STATUS WORD
15190	ARL	18	PUT BOTH
15200	LLS	18	IN ONE WORD
15210	STA	2,IC	AND STORE IN SEQ.
15220	DRL	PSEUDO	PERFORM PSEUDO
15230	ZERO		
15240CALTS	LDA	SSNAME,\$	GRAB SS NAME AGAIN
15250	CHPA	ABLNK,\$	WAS IT BLANK AND/OR ZERO?
15260	TZE	CLTX,\$	YES, DON'T DO CALLSS
15270	LDQ	0,DU	GET A ZERO
15280	DRL	SETSWH	SEE WHAT THE SWITCH WORD SAYS
15290	ANQ	=02000,DU	ONLY INTERESTED IN BREAK BIT
15300	STQ	BUF,\$	SAVE FOR LATER RESTORE
15310	TZE	2,IC	IF ZERO, DON'T BOTHER RESETTNG IT
15320	DRL	RSTSWH	BUT IF NONZERO. . .
15330	DRL	CALLSS	ALL READY, PUSH TO SS
15340SSNAME	ZERO		
15350	LDQ	BUF,\$	WE'RE BACK, RETRIEVE BIT
15360	TZE	2,IC	IF ZERO, DON'T SET
15370	DRL	SETSWH	NONZERO, MUST RESTORE BIT
15380CLTX	RETURN	CALLTS	EXIT TO CALLER
15390	TTLS		
15400	REM		
15410	REM		
15420	REM		
15430ULASCI	SAVE		
15440	LDQ	3,1*	UPPER/LOWER CASE ASCII ROUTINE
15450	SRQ	1,DL	GET STARTING CHARACTER NUMBER
15460	DIV	4,DL	HIS 1 IS OUR 0
15470	ALS	18	0 CHARS PER WORD
15480	LLR	18	PLACE CHAR POS IN LOWER
15490	ADQ	32,DL	AND WORD OFFSET IN UPPER
15500	STQ	TALLY,\$	MAKE TALLYB
15510	LDA	4,1*	AND STORE IN SCRATCH
15520	ALS	6	GET CHARACTER COUNT
15530	ANA	-1,DL	SHIFT
15540	ASA	TALLY,\$	REMOVE CRUD AGAIN
15550	EAA	2,1*	ADD TO THE CONFUSION
15560	ASA	TALLY,\$	GET DATA LOC
15570	EAXO	TALLY,\$	COMPOUND INTEREST
15580	STUFF	X0,(T1,T2,T3,T4)	GET ADDRESS OF OUR TALLY
15590	LXLO	5,1*	
15600	LDQ	LIMITS+2,\$	GRAB U/L FLAG
			ASSUME UPPER

#### ULASCI

#### ULASCI ROUTINE--FORCE UPPER/LOWER CASE ASCII

UPPER/LOWER CASE ASCII ROUTINE  
 GET STARTING CHARACTER NUMBER  
 HIS 1 IS OUR 0  
 0 CHARS PER WORD  
 PLACE CHAR POS IN LOWER  
 AND WORD OFFSET IN UPPER  
 MAKE TALLYB  
 AND STORE IN SCRATCH  
 GET CHARACTER COUNT  
 SHIFT  
 REMOVE CRUD AGAIN  
 ADD TO THE CONFUSION  
 GET DATA LOC  
 COMPOUND INTEREST  
 GET ADDRESS OF OUR TALLY  
 GRAB U/L FLAG  
 ASSUME UPPER

15610	ANX0	1,DU	UNLESS WE FIND OUT OTHERWISE
15620	TZE	2,IC	NOW ABOUT THAT?
15630	LDQ	LIMITS+3,\$	OH, WELL. . .
15640	EAX1	LIMITS,\$	ADDRESS OF OTHER LIMITS
15650	STX1	1,IC	STORE
15660	LDA	**0	LOAD LOW LIMIT TO BE ALTERED
15670T1	CWL	**CI	GET A CHARACTER. IS IT?
15680	TNZ	6,IC	NOPE, LEAVE IT ALONE
15690T2	LDA	**CI	AMA! GRAB HIM
15700	ERA	=040,DL	ZAP! IF YOU WERE, YOU AREN'T NOW.
15710T3	STA	**SC	STORE BACK WHERE IT CAME FROM
15720	TTF	-6,IC	MORE TO GO?
15730	TRA	3,IC	ALL DONE, EXIT
15740T4	NOP	**SC	ADVANCE TALLY
15750	TTF	-8,IC	MORE?
15760	RETURN	ULASCI	THIS WAY OUT
15770	TTLs		BCDASC--ASCB CD
15780	REM		
15790	REM		
15800	REM		BCDASC/ASCB CD ROUTINES
15810BCDASC	SAVE	2,7	BCD TO ASCII TRANSLITERATOR
15820	EAX2	XPARAM,\$	GET POINTERS TO PARAMETERS
15830	TSX7	XINIT,\$	AND GO INITIALIZE
15840	RETURN	BCDASC	DONE, EXIT
15850ASCB CD	SAVE	2,7	ASCII TO BCD ENTRY
15860	EAX2	XPARAM+6,\$	NEEDED DATA
15870	TSX7	XINIT,\$	INITIALIZE
15880	RETURN	ASCB CD	ALL DONE
15890	EJECT		
15900XINIT	EAX0	BUF,\$	LOAD TALLY ADDRESS
15910	STX0	S1,\$	STORE
15920	EAX0	1,0	STORE TALLY ADDRESS
15930	STUFF	X0,(S5,S7)	STUFF IT TOO
15940	LXLO	4,2	GET # CH / WD IN CODE WE'RE GOING TO
15950	STX0	S2,\$	STORE IN DIVIDE
15960	LXLO	5,2	THIS IS WHAT A BLANK LOOKS LIKE
15970	STX0	S6,\$	STORE IT TOO
15980	EAX0	6,2	POINTER TO XLIT TABLE POINTER
15990	STX0	S3,\$	STORE IT
16000	EAX0	7,2	AND THE PTR TO SHIFT TABLE PTR
16010	STX0	S4,\$	DITTO
16020	EAX	BCDTAB,\$	ADDRESS OF XLIT TABLES, BCDASC
16030	EAQ	SHFTB,\$	AND BCDASC SHIFT TABLE
16040	STAQ	XPARAM+6,\$	STORE INDIRECT WORD
16050	EAX	ASCTAB,\$	ADDRESS OF ASCB CD XLIT TABLE
16060	EAQ	SHFTA,\$	AND SHIFT TABLE
16070	STAQ	XPARAM+14,\$	TO ITS INDIRECT WORD
16080	LDQ	3,1*	GET CHARACTER POSITION
16090	SRQ	1,DL	CORRECT
16100	DIV	0,2	DIVIDE BY # CH / WD
16110	ALS	18	SHIFT
16120	LLR	18	TO TALLY FORMAT

16130	ADQ	1,2	ADD CONDITIONAL TALLYB
16140	STQ	BUF,\$	STORE
16150	EAA	2,1*	LOAD DATA ADDRESS
16160	ASA	BUF,\$	PLACE IN TALLY
16170	LDQ	5,1*	BUILD OTHER TALLY BY SIMILAR PROCESS
16180	SBQ	1,DL	
16190	DIV	2,2	
16200	ALS	18	
16210	LLR	18	
16220	ADQ	3,2	
16230	STQ	BUF+1,\$	STORE
16240	EAA	4,1*	
16250	ASA	BUF+1,\$	STORE ADDRESS
16260	LDA	6,1*	GET CHARACTER COUNT
16270	ALS	6	SHIFT
16280	ANA	-1,DL	DROP GARBAGE
16290	ORSA	BUF+1,\$	PLACE IN TALLY
16300S1	LDQ	**,\$C	GET A CHARACTER.
16310S2	DIV	**,\$L	WHERE IS IT?
16320S3	LDQ	**,\$QL	LOAD CORR WORD
16330S4	XEC	**,\$AL	MOVE TO LOWER CHAR POS
16340S5	STQ	**,\$C	STORE
16350	TTF	-5,IC	CONTINUE
16360	SZN	7,1*	DOES HE WANT BLANK FILL?
16370	TZE	0,7	NO, RETURN
16380S6	LDA	**,\$L	YES, GET A BLANK
16390	LDQ	7,DL	AND A MASK.
16400	CANQ	BUF+1,\$	IS THE WORD FILLED?
16410	TZE	0,7	YES, QUIT
16420S7	STA	**,\$C	NO, STORE BLANK
16430	TRA	-3,IC	CONTINUE
16440	TTLs		BREAK PROCESSING
16450	REM		
16460	REM		BREAK PROCESSOR--FLGERK
16470	REM		
16480	INNB	ON	BREAK PROCESSING MUST BE INHIBITED
16490BRKP	STA	SVA,\$	SAVE AR
16500	LDA	1,DU	GET A .TRUE.
16510	STA	FLAG,\$*	STORE IN FLAG VAR
16520	AOS	CNT,\$	COUNT THIS BREAK
16530	TPL	OVER,\$	OOPS!!! MAYBE WE'D BETTER ASK,
16540	EAA	BRKP,\$	RESET BREAK VECTOR
16550	ORA	TRA,DL	WITH A TRA
16560	STA	13	
16570	LDA	SVA,\$	RETRIEVE AR
16580	RET	12	AND CONTINUE
16590OVER	LDA	SVA,\$	RETRIEVE AR
16600	SREG	REGS,\$	MOVE REGISTERS TO A SAFE PLACE
16610	LDA	12	ALSO SAVE IC&I FOR A POSSIBLE RET
16620	STA	REGS+7,\$	(DON'T REALLY NEED THE TIMER REGISTER)
16630AGAIN	EAA	0,IC	RESET BREAK VECTOR HERE
16640	ORA	TRA,DL	TO PREVENT DISASTERS



16650	STA	13	IN THE EVENT OF RECURSIVE BREAKS
16660	EAA	MSG,\$	LOC OF A MESSAGE
16670	ORA	30*64+32,DL	MANUFACTURE A TALLY
16680	STA	TALLY+2,\$	STORE IN SCRATCH
16690	EAA	TALLY+2,\$	AND A TALLY
16700	ORA	64,DL	THAT POINTS TO THE TALLY
16710	STA	TALLY+1,\$	IN THE PREVIOUS WORD
16720	EAA	TALLY+1,\$	AND YET ANOTHER POINTER
16730	STA	2,IC	STORE IN KOUTN
16740	ORL	KOUTN	WRITE MESSAGE
16750	ZERO		
16760	EAA	BUF+2,\$	ADDRESS OF INPUT BUFFER
16770	EAQ	TALLY+1,\$	SCRATCH
16780	ARL	18	COMBINE
16790	LLS	18	
16800	EAQ	STAT,\$	MORE SCRATCH
16810	ESTAQ	2,IC	STORE IN CALL
16820	ORL	KIN	RETRIEVE INPUT
16830	ZERO		
16840	ZERO		
16850	SZM	TALLY+1,\$	WAS THERE ANY?(THERE SHOULD BE)
16860	TZE	AGAIN,\$	HUH?
16870	LDA	BUF+2,\$	GET FIRST WORD OF INPUT
16880	ARL	27	ISOLATE FIRST CHARACTER
16890	ORA	=040,DL	FORCE LOWER CASE
16900	CHPA	=0163,DL	IS IT AN S?
16910	TNZ	2,IC	NO
16920	ORL	RETURN	SCREEEEEECH!!!!
16930	CHPA	=0141,DL	HOWABOUTAWA?
16940	TNZ	2,IC	STILL NO
16950	ORL	ABORT	BOOOOOOOH!!!!
16960	CHPA	=0143,DL	LAST CHANCE--IS IT A C?
16970	TNZ	AGAIN,\$	IT'S YOUR MONEY, NOT MINE.
16980	LCA	20,DL	GET A -20
16990	STA	CNT,\$	RESTORE COUNT
17000	EAA	BRKP,\$	BUILD A TRA
17010	ORA	TRA,DL	TO THE ORIGINAL BREAK ROUTINE
17020	STA	13	AND STORE IN VECTOR
17030	LREG	REGS,\$	GRAB REGISTERS
17040	RET	REGS+7,\$	AND RETURN
17050	INHIB	OFF	ALL THROUGH WITH THE HEAVY STUFF
17060	TTLs		STORAGE & CONSTANTS
17070	REM		
17080	REM		
17090	REM		
17100	IPARAMEDEC	6,0,4,32,4,32,0,0	
17110	DEC	4,32,6,0,6,16,0,0	
17120	SMFTA	ORL 5*6	ASCB CD SHIFT TABLE
17130	ORL	4*6	
17140	ORL	3*6	
17150	ORL	2*6	
17160	ORL	1*6	

17170	NOP	0,DU	
17180	SHFTB	QRL	3*9
17190	QRL	2*9	BCDASC SHIFT TABLE
17200	QRL	1*9	
17210	NOP	0,DU	
17220	ASCTAB	BSS	5
17230	BCI	9,00	1-#5X&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPS
17240	BCI	8,	TUVWXYZ['']\0ABCDEFGHIJKLMNOPSSTUVWXYZ00000
17250	BCDTAB	ASCII	13,0123456789[01]? ABCDEFGHI&.](<'JKLMNOPS-0*);'+/ST
17260	ASCII	3,	UVWXYZ\,X="!
17270	FLAG	ZERO	POINTER TO FLGBRK FLAG
17280	STAT	BSS	1
17290	ABLNK	ASCII	1,
17300	TALLY	BSS	3
17310	BUF	BSS	23
17320	LIMITS	QCT	141,101,172,132
17330	CNT	DEC	-20
17340	MSG	QCT	015012012177
17350		UASCI	7,*BREAK: STOP OR CONTINUE?
17360	REGS	8BSS	8
17370	SVa	EQU	REGS
17380		ORG	REGS
17390		SYNDEF	SAVE
17400	SAVE	LDQ	=3H0H*,DL
17410		HME	GESAVE
17420		BCI	1,YSFUTL
17430		ZERO	.PZER...PLST.-.PZER, SIZE & LENGTH
17440		ZERO	FLGBRK
17450		HME	GEFINI
17460		EIGHT	
17470		LIT	
17480		ERLK	
17490	PLST.	NULL	
17500	END		
17510	%	GNAP	
17520	LBL		PACK0000, PACK, UNPACK, MOVE 6000 PORT BCD/ASCII
17530	TTL		PACK, UNPACK, MOVE BCD/ASCII STRINGS 6000 PORTRAM
17540	TTL		
17550	EDITP	ON	
17560	SYNDEF	PACK	
17570	SYNDEF	UNPACK	
17580	SYNDEF	MOVE	
17590	BCI	1,740926	
17600	DATE		VERSION DATE
17610	MOVE	STX1	.E.L..
17620		STI	.E.L..
17630		STX7	RET+1
17640		EXX7	HV
17650		TRA	*+10
17660	PACK	STX1	.E.L..
17670		STI	.E.L..
17680		STX7	RET+1
			AND X7

17690	EAX7	PK	GET LOC OF PACK TABLE
17700	TRA	*+5	GO TO COMMON PROCEDURE
17710	UNPACK STX1	.E.L..	SAVE REGISTERS
17720	STI	.E.L..	
17730	STX7	RET+1	
17740	EAX7	UPK	GET LOC OF UNPACK TABLE
17750	STX6	RET	SAVE ANOTHER REGISTER
17760	EAA	2,1*	CHECK OUT FIRST ARGUMENT
17770	TNZ	*+9	IS IT NULL?
17780	SZN	3,1*	IT IS. CHECK SECOND ARGUMENT
17790	TZE	*+4	IS IT NONZERO?
17800	EAX6	ASC	IT IS. SET MODE TO ASCII
17810	STX6	X6	
17820	TRA	RET	AND RETURN
17830	EAX6	BCD	SECOND ARG IS ZERO, SET MODE BCD
17840	STX6	X6	
17850	TRA	RET	RETURN
17860	LDX6	X6	FIRST ARG IS NOT NULL - GET MODE
17870	EAA	2,1*	GET LOC OF "FROM" AREA
17880	STA	TAL1	PLACE ADDRESS IN TALLY WORD
17890	EAA	4,1*	GET LOC OF "TO" AREA
17900	STA	TAL2	PLACE IN OTHER TALLY WORD
17910	LDA	6,1*	GET CHARACTER COUNT
17920	ALS	6	SHIFT FOR TALLY COUNT
17930	ANA	-1,DL	DROP REFUSE
17940	ORSA	TAL2	AND "OR" INTO TALLY
17950	LDQ	3,1*	GET "FROM" CHARACTER POSITION
17960	SBQ	1,DL	ADJUST FOR FORTRAN'S INDEXING
17970	XED	6,7	PRODUCE OFFSET & CPOS
17980	LLR	18	
17990	XEC	5,7	ADD CCNDITIONAL TALLYB BIT
18000	ASQ	TAL1	MODIFY THE TALLY AS REQUIRED
18010	LDQ	5,1*	GET "TO" CHARACTER POSITION
18020	SBQ	1,DL	ADJUST INDEX
18030	XED	8,7	PRODUCE OFFSETS
18040	LLR	18	
18050	XEC	10,7	AND CONDITIONAL TALLYB
18060	ASQ	TAL2	ADD TO TALLY WORD
18070	XED	0,7	PROCESS THE CHARACTER STRING
18080	XED	2,7	ACCORDING TO ENTRY POINT AND MODE
18090	TTF	*-2	USING TALLIES WE JUST BUILT
18100	XEC	4,7	CHECK FOR BLANK FILL REQUIRED
18110	TZE	RET	RETURN IF NONE
18120	LDA	1,6	ELSE GET A BLANK
18130	LDQ	7,DL	AND A MASK
18140	CANQ	TAL2	IS THE LAST WORD FULL?
18150	TZE	RET	IT IS, SO RETURN
18160	STA	TAL2,SC	IT ISN'T, SO ADD A BLANK
18170	TRA	*-3	GO CHECK AGAIN
18180	RET	**DU	RESTORE REGISTERS
18190	LDX7	**DU	
18200	RET	.E.L..	AND RETURN TO CALLER



18210PK	ELDA	TAL1,ID	GET A WORD
18220	ARL	0,6*	RIGHT JUSTIFY THE CHARACTER
18230	STA	TAL2,SC	STORE IT
18240	TTF	-1,IC	AND CONTINUE
18250	SZN	7,1*	CHECK FOR BLANK FILL
18260	NOP	0,DU	
18270	NOP	0,DU	
18280	LDA	0,DU	ZERO THE AR
18290	DIV	3,6	DIVIDE FOR PROPER TALLY CPOS
18300	ALS	18	PUT REMAINDER IN AU
18310	ORQ	2,6	POSSIBLY SET TALLYB BIT
18320UPK	ELDA	TAL1,SC	GET A CHARACTER
18330	ALS	0,6*	PUT IT IN AU
18340	ORA	1,6	BLANK FILL IT
18350	STA	TAL2,ID	AND STORE THE WORD
18360	TRA	RET	NO BLANK FILL ON UNPACK
18370	ORQ	2,6	ADD POSSIBLE TALLYB
18380	DIV	3,6	DIVIDE FOR OFFSET & CPOS
18390	ALS	18	PLACE REMAINDER (CPOS) IN AU
18400	NOP	0,DU	
18410	LDA	0,DU	ZERO AR
18420	NOP	0,DU	
18430MV	ELDA	TAL1,SC	GET A CHARACTER
18440	STA	TAL2,SC	STORE IT AGAIN
18450	TTF	-1,IC	LOOP
18460	TRA	2,IC	BREAK OUT OF LOOP
18470	SZN	7,1*	CHECK FOR BLANK FILL
18480	ORQ	2,6	SET TALLYB BIT
18490	DIV	3,6	COMPUTE OFFSET & CPOS
18500	ALS	18	PUT CPOS IN AU
18510	DIV	3,6	COMPUT OFFSET & CPOS (THE OTHER ONE)
18520	ALS	18	POSITION
18530	ORQ	2,6	SET BIT
18540BCD	ARG	30	# OF BITS TO SHIFT
18550	BCI	1,0	BLANK FILL
18560	OCT	0	NO TALLYB BIT
18570	DEC	6	6 CHARACTERS PER WORD
18580ASC	ARG	27	# OF BITS TO SHIFT
18590	OCT	000040040040	BLANK FILL
18600	OCT	40	THE TALLYB BIT
18610	DEC	4	FOUR CHARACTERS PER WORD
18620TAL1	BSS	1	WORD INTO WHICH "FROM" TALLY IS BUILT
18630TAL2	BSS	1	DITTO, "TO" TALLY
18640X6	ARG	ASC	POINTER TO BCD/ASCII PARAMETERS
18650	END		
18660\$	GNAP		
18670	LBL	DIMXXX, ALLOCATE STORAGE FOR DISTORT	
18680	TTL	ALLOCATE STORAGE FOR DISTORT	
18690	SYNDEF	..... ENTER THE BATCH PORTION THRU HERE	
18700	SYNREF	.FBAD.	
18710HOLE	EQU	31	LOCATION OF AVAIL CORE WORD
18720.....	LDA	1,DL	OPEN FILE 01 AS INPUT

DIMXXX

18730	STA	.FBAD.	
18740	CALL	.FOPEN(=0)	IN ORDER TO ALLOCATE BUFFERS
18750	LDA	2,DL	DO THE SAME FOR FILE 02
18760	STA	.FBAD.	
18770	CALL	.FOPEN(=1)	EXCEPT OUTPUT
18780	LDA	6,DL	FILE 06 TOO
18790	STA	.FBAD.	
18800	CALL	.FOPEN(=1)	ALSO OUTPUT
18810	LXLO	HOLE	NOW THAT OTHER DEMANDS HAVE BEEN SATISFIED
18820	SBXO	HOLE	COMPUTE AVAILABLE CORE LEFT
18830	EAQ	0,0	DIVIDE BY 2 AND STORE FOR COMPARE
18840	QRL	18	SHIFT TO LOWER HALF
18850	SBLO	1600,DL	SAVE SPACE FOR RANDOM FILE
18860	QRL	1	DIVIDE BY 2
18870	STQ	AVAIL	
18880	LDQ	DIM	GET TRIAL ARRAY DIMENSION
18890	MPY	DIM	SQUARE IT
18900	CMFQ	AVAIL	AND CHECK TO SEE IF IT'S TOO BIG
18910	TRC	*+3	IT IS
18920	AOS	DIM	IT'S NOT. INCREASE AND TRY AGAIN
18930	TRA	*-5	
18940	LCA	1,DL	DECREASE DIM BY 1 SO IT FITS
18950	ASA	DIM	
18960	LDXO	HOLE	GET LOC OF AVAIL
18970	STXO	CALL+3	STORE IT IN CALLING SEQ
18980	STXO	CALL+4	
18990	LDQ	DIM	SQUARE ARRAY DIMENSION
19000	MPY	DIM	TO GET EXTENT OF EACH ARRAY
19010	QLS	18	SHIFT TO QU
19020	ASQ	CALL+4	AND ADD TO OFFSET SECOND ARRAY
19030	QLS	1	MULT DIM**2 BY 2
19040	ASQ	HOLE	AND UPDATE CORE USED
19050	MME	GESNAP	SNAP CALL FOR DEBUGGING
19060	ZERO	CALL+3,4	
19070	CALL	MAIN(**,**,DIM)	
19080	DIM	DEC 1	DIMENSION OF ARRAYS
19090	AVAIL	BSS 1	AVAIL CORE / 2
19100	END		
19110\$	FORTRAN		USANA1
19120*			
19130	CHAIN	***MAIN PROGRAM***	
19140*			
19150*			
19160*		MAIN PROGRAM	
19170*			
19180*			
19190		SUBROUTINE MAIN(C1,C2,IDIM)	
19200		COMMON X,Y,Z,X1,Y1,Z1,H0,NS,FP,AK,IG,WN,NB,AC,BC,IT,AZ,WA,RNG	
19210	1	,GREL,TRANEL,ANTEL,DTA,BTA,DBM,IFP,IFT,IRG	
19220		DIMENSION C1(IDIM,IDIM),C2(IDIM,IDIM)	
19230		DIMENSION H0(200),RA(200),X(200),Y(200),Z(200),AV(200),	
19240	1	BV(200),AZ(351),L1(200),NS(200),IF(200),IZ(200),AC(500).	

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19250      2 RNG(6),FA(40),AP(5),BP(5),ZZ(5),AO(5),BQ(5),LR(500),
19260      3 IT(20),C5(3,3),BC(500),A3(13),B3(13),C3(5,16),C4(5,16),
19270      4 FR(10),IV(10),C6(3,3),BZ(200),X1(200),Y1(200),Z1(200),
19280      5 S3(5),EE(4),FF(4),NP(20),ALT(6)
19290      CALL RANSIZ(03,9)
19300      N5=1;N6=13
19310      AN=N5-1
19320      CN=N6-1
19330*
19340*      ***READ :PART OF FILE 01
19350*
19360      READ(1,10) NB,NW,KW,II2,GP,CL
19370      IG=0
19380      IF(GP.GT..5) IG=1
19390      IC=0
19400      IF(CL.GT..5) IC=1
19410      READ(1,12) (H0(I),I=1,NW)
19420      READ(1,14) (RA(I),I=1,NW)
19430      READ(1,12) (X(I),I=1,NW)
19440      READ(1,12) (Y(I),I=1,NW)
19450      READ(1,12) (Z(I),I=1,NW)
19460      DO 4 I=1,NW
19470 4      BZ(I)=0,
19480      IF(II2.NE.0) READ(1,16) (BZ(I),I=1,NW)
19490 17      FORMAT(4F8.1,F9.6,2F6.1)
19500      READ(1,18) IFP,IFT,IDB,IRG,ATHE,APHI,AINT,AIMP,DPER
19510      IF(IRG.EQ.1) READ(1,17) GREL,TRANEL,ANTEL,DTA,BTA,DBH,APIH
19520      IF(IRG.EQ.1) READ(1,12) (FA(I),I=1,NW)
19530      IF(IRG.EQ.1) READ(1,15) NA,(ALT(I),I=1,NA)
19540      DDD=DBH
19550      DBH=1,E-3*10.*(DBH*.1)
19560 15      FORMAT(I3,(6F8.1))
19570*
19580*      ***SPECIFY SUB-ANTENNA POSITIONS (X,Y,Z) AND (X1,Y1,Z1)
19590*
19600      CALL PXYZ
19610 10      FORMAT(3I4,I2,2F3.0)
19620 12      FORMAT(9F7.3)
19630 14      FORMAT(8F8.5)
19640 16      FORMAT(6E11.3)
19650 18      FORMAT(4I3,4F7.2,F6.1)
19660 20      FORMAT(I5,15I4)
19670 3      FORMAT(3I4,2I3,F7.2)
19680      DO 100 KV=1,KW
19690*
19700*      ***READ:THE REST OF FILE 01
19710*
19720      READ(1,3) MM,NZ,IV(KV),XI4,II6,FR(KV)
19730      HX=.015
19740      ALAM=300./FR(KV)
19750      IW=IV(KV)
19760      DO 6 I=1,NW

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19770      BV(I)=0.
19780 6      AZ(I)=0.
19790      READ(1,12) (AV(I),I=1,NM)
19800      IF(II4.NE.0) READ(1,12) (BV(I),I=1,NM)
19810      IF(II6.NE.0) READ(1,16) (AZ(I),I=1,NM)
19820      READ(1,20) (NS(I),I=1,NM)
19830      READ(1,20) (LI(I),I=1,NM)
19840      READ(1,20) (IF(I),I=1,NM)
19850      IF(IC.EQ.1) READ(1,20) (IZ(I),I=1,NM)
19860*      IF(NB.NE.0) WRITE(2,320) IV(KV),FR(KV)
19870      IF(NB.NE.0) WRITE(2) 1,2,IV(KV),FR(KV)
19880 320      FORMAT(/' *** ANT# (FED)=' ,I3,1X,' FREQ (MHZ)=' ,F7,2,' ****)
19890      FP=FR(KV)*1.E6
19900      IF(NB.NE.0) WRITE(6,320) IV(KV),FR(KV)
19910*      IF(IRC.EQ.1) WRITE(2,305) DDD,APIN
19920      IF(IRC.EQ.1) WRITE(6,305) DDD,APIN
19930 305      FORMAT(/' RECEIVER SENSITIVITY (DBM)=' ,F6,1/
19940 1 ' TRANSMITTER POWER (WATT)  =' ,F6,1//)
19950 310      A4=0.
19960      B5=0.
19970      DO 24 I=1,NM
19980      LR(I)=0
19990      DO 24 J=1,NM
20000      C1(I,J)=0.
20010 24      C2(I,J)=0.
20020      DO 19 I=1,5
20030      DO 19 J=1,16
20040      C3(I,J)=0.
20050 19      C4(I,J)=0.
20060      EF=0.
20070      EG=0.
20080      AK=2.*3.141593
20090      CW=AK*.25/CW
20100      EPS=1.E-9/(18.*AK)
20110      XMU=2.E-7*AK
20120      ONE=AK*FP
20130      OMP=ONE*EPS
20140      XK=ONE/3.E8
20150      XL=XK*XK
20160*
20170*      ***CALCULATE THE GENERALIZED IMPEDANCE MATRIX C1,C2
20180*
20190      K2=2
20200      IF(IG.EQ.0) K2=1
20210      BLO=ALOG(2.)
20220      II=0
20230      K3=0
20240      K=0
20250      NX=NB
20260      IF(NB.EQ.0) NX=NM
20270      DO 325 KS=1,NX
20280      NK=0

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20290      NK=1
20300      NP(KS)=0
20310      IF(NB,EQ,0) GO TO 8
20320      IU=-1
20330      IF(IT(KS),EQ,1097) NK=5
20340      IF(IT(KS),EQ,197) NK=26
20350      IF(NK,EQ,26,AND,IW,EQ,KS) HK=1
20360      DO 324 KQ=1,NK
20370      K=K+1
20380*
20390*      ***HK=1: #197 FEED AND CURRENTS ARE SYMMETRICAL ABOUT AXIS
20400*      ***KQ:SUB-ANTENNA NUMBER
20410*
20420      IF(HK,EQ,1,AND,KQ,GT,3,AND,KQ,NE,15) GO TO 324
20430      L=0
20440*
20450*      ***USE THE SYMMETRY PROPERTY OF #197 ANTENNA
20460*      ***ABOUT THE AXIS ,WHEN IT IS FED,FOR KQ=1,2
20470*
20480      MV=0
20490      K9=K-1
20500      KG=1
20510      IF(IG,NE,0,AND,ABS(Z(K)),LT,1,E-5) KG=0
20520      AS=NS(K)+KQ
20530      IF(NK-26) 298,290,298
20540 290      IF(KQ-2) 295,298,292
20550 292      IF(KQ-14) 295,295,294
20560 294      MV=2
20570      AS=AS-1,
20580      GO TO 298
20590 295      MV=1
20600      AS=AS-1,
20610 298      DK=HO(K)/AS
20620      NP(KS)=NP(KS)+NS(K)
20630      IF(K,EQ,1) GO TO 26
20640 182      II=II+NS(K9)
20650 26      NSK=NS(K)
20660      J=0
20670      DO 80 LS=1,NX
20680      NL=1
20690      ML=0
20700      IF(NB,EQ,0) GO TO 9
20710      IF(IT(LS),EQ,1097) NL=5
20720      IF(IT(LS),EQ,197) NL=26
20730      IF(NL,EQ,26,AND,LS,EQ,IW) ML=1
20740 9      DO 80 LQ=1,NL
20750      L=L+1
20760      L9=L-1
20770      K8=0
20780      KG=1
20790      IF(K,NE,L,OR,RA(L),LT,.02*ALAM) KG=0
20800      IF(IG,NE,0,AND,ABS(Z(K)),LT,1,E-5) KG=0

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20810      LG=1
20820      IF(IG) 126,128,126
20830 126   IF(Z(L)) 128,127,128
20840 127   LG=C
20850 128   AT=NS(L)+LG
20860      MW=0
20870      IF(NL-26) 288,281,288
20880 281   IF(LQ-2) 285,288,282
20890 282   IF(LQ-14) 285,285,284
20900 284   MW=2
20910      AT=AT-1,
20920      GO TO 288
20930 285   MW=1
20940      AT=AT-1,
20950 288   DL=MO(L)*.5/AT
20960      IF(K,NE,L,OR,RA(L).LT..02*ALAM) LG=0
20970      ALP=DL*.5
20980      XKD=XK*ALP
20990      AP1=1.005*ALP
21000      AKL=AK*ALP
21010      XD=XKD*XKD
21020      AW=2,*.ALP/AN
21030      IF(L9) 28,28,180
21040 180   IF(HL.EQ.0) GO TO 134
21050      IF(LQ.GT.3.AND.LQ.NE.15) GO TO 28
21060 134   J=J+NS(L9)
21070 28    NSL=NS(L)
21080      DO 460 KK=1,K2
21090      N1=1
21100      G=3-2*KK
21110      IF(KK-1) 162,146,162
21120 146   IF(NB) 148,164,148
21130 148   IF(KS-LS) 440,430,440
21140 430   IF(LS.EQ.1) GO TO 440
21150      IF(IU.EQ.0) GO TO 440
21160      IF(IU.GT.0) GO TO 460
21170      L8=26
21180      IF(IT(LS).EQ.197.AND.LS.NE.IW) GO TO 435
21190      IF(IT(LS).NE.1097) GO TO 440
21200      IF(LS.EQ.IW.AND.IC.EQ.0) GO TO 440
21210      L8=5
21220 435   LX=LS
21230      K1=LS-1
21240      IU=0
21250      DO 438 JX=1,K1
21260      IF(L8-10) 445,445,443
21270 443   IF(JX.EQ.IW.OR.IT(JX).NE.197) GO TO 438
21280      GO TO 448
21290 445   IF(IT(JX).NE.1097.OR.(JX.EQ.IW.AND.IC.EQ.0)) GO TO 438
21300 448   IU=IU+1
21310      KX=JX
21320 438   CONTINUE

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21330      IF(IU, EQ. 0) GO TO 440
21340      CALL QZP(K1, L8, II, L9, MX, MZ, KX, MP)
21350      DO 450 I=1, MZ
21360      MP=MX+I
21370      KM=II+I
21380      DO 450 JX=1, MZ
21390      MQ=MX+JX
21400      LN=II+JX
21410      C1(KM, LN)=C1(MP, MQ)
21420      C2(KM, LN)=C2(MP, MQ)
21430 450    CONTINUE
21440      GO TO 460
21450 440    IF(K9) 164, 164, 138
21460 138    IF(K-L) 164, 139, 164
21470 139    IF(NL, EQ. 26, OR, IT(KS), EQ. 1000) GO TO 164
21480      DO 152 K5=1, K9
21490      RR=RA(K5)-RA(K)
21500      HH=H0(K5)-H0(K)
21510      HN=NS(K5)-NS(K)
21520      RH=RR*RR+HH*HH+HN*HN
21530      IF(RH-1, E-6) 150, 152, 152
21540 150    DO 156 K7=1, K3
21550      K8=K7
21560      IF(LR(K7)-K5) 156, 154, 156
21570 156    CONTINUE
21580 154    GO TO 164
21590 152    CONTINUE
21600      GO TO 164
21610 162    IF(Z(L)) 164, 158, 164
21620 158    M1=2
21630 164    KP=(KK-1)**2+(K-L)**2
21640      DO 455 M=1, NSK
21650      KM=II+M
21660      IF(KP) 23, 22, 23
21670 22    IF(NL, EQ. 26) GO TO 23
21680      M1=M
21690 23    ZK=M-1+KG
21700      PZK=Z(K)+DK*ZK
21710      IF(IG, NE. 0, AND, ABS(Z(K)), LT, 1, E-5) ZK=ZK-1
21720      DO 78 N=M1, NSL
21730      LN=J+N
21740      IF(IT(KS), EQ. 1000) GO TO 31
21750      IF(KK-1) 31, 25, 31
21760 25    IF(NL, EQ. 26, OR, NK, EQ. 26) GO TO 32
21770      IF(L-K) 78, 27, 31
21780 27    IF(M1-1) 29, 29, 72
21790 29    IF(K9) 173, 31, 173
21800 173    IF(K8) 31, 31, 174
21810 174    CC=C3(K8, N)
21820      CD=C4(K8, N)
21830      GO TO 76
21840 32    IF(KS, NE, LS) GO TO 31

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21850      IF(KK.EQ.2) GO TO 11
21860      IF(ML.EQ.1) GO TO 11
21870      IF(KQ.LE.3.AND.LQ.LE.3) GO TO 31
21880      IF(LQ.NE.3.AND.LQ.NE.15) GO TO 36
21890      IF(KQ.GT.3.AND.KQ.NE.15) GO TO 37
21900      GO TO 31
21910 36    IF(KQ.EQ.3.OR.KQ.EQ.15) GO TO 31
21920      JP=0
21930      JQ=0
21940      IF(KQ.GE.4.AND.KQ.NE.15) JP=NS(K)
21950      IF(LQ.GE.4.AND.LQ.NE.15) JQ=NS(L)
21960      GO TO 40
21970 11    IF(KQ.GT.2) GO TO 31
21980      IF(LQ.LE.3.OR.LQ.EQ.15) GO TO 31
21990      CC=C5(M,N)
22000      CD=C6(M,N)
22010      GO TO 76
22020 31    ZL1=N-1+LG
22030      CC=0,
22040      CD=0,
22050      MC=4
22060      IF(K.NE.L.OR.RA(L).LT..02*ALAM) MC=1
22070      DO 69 MN=1,MC
22080      IF(MC.EQ.1) GO TO 35
22090      IF(MN-1) 34,35,34
22100 34    IF(MN-3) 64,35,35
22110*
22120*      ***SIN EXPANSION AND PULSE TESTING FOR
22130*      ***RADIUS <0.02 OF WAVELENGTH
22140*
22150 35    AMN=MN-1
22160      ZL=ZL1+ZL1-1.5+AMN
22170      IF(MC.EQ.4) GO TO 329
22180      ZL=ZL1+.5
22190      IF(IG.NE.0.AND.ABS(Z(L)).LT.1.E-5) ZL=ZL-1
22200      JQ=11-(KK-1)*4
22210      IF(NL.LT.6) GO TO 108
22220      IF(ML.EQ.0) JQ=7-(KK-1)*2
22230      IF(ML.EQ.0.AND.IC.EQ.0) JQ=5
22240 108    IF(KS.NE.LS) JQ=3
22250      QJ=JQ-1
22260      KT=JQ/2+1
22270      QK=KT-1
22280      JY=1
22290      IF(N.EQ.N1.OR.JQ.EQ.3) GO TO 361
22300      JY=2
22310      A3(1)=A3(JT)
22320      B3(1)=B3(JT)
22330 361    JT=JQ
22340      DO 360 JJ=JY,JT
22350      AJ=JJ-1
22360      DL=H0(L)/AT

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22370      IF(JJ,LE,KT) DD=DL/QJ
22380      DE=DL/QJ
22390      ZD=(ZL+AJ/QJ)*DL
22400      RQ=RA(L)
22410      T1=X1(L)-X(L)
22420      T2=Y1(L)-Y(L)
22430      T3=Z1(L)-Z(L)
22440      R1=SQRT(T1*T1+T2*T2+T3*T3)
22450      IF(JJ,LE,KT,OR,MW,NE.1) GO TO 363
22460      IF(N,NE,NSL) GO TO 363
22470      DL=HX
22480      DE=DL/QJ
22490      RQ=.002
22500      T1=0.
22510      T2=0.
22520      T3=1.
22530      R1=1.
22540      PXL=X1(L)
22550      PYL=Y1(L)
22560      PZL=Z1(L)+(AJ-QK)*DE
22570      GO TO 370
22580 363      IF(JJ,GT,KT,OR,MW,NE.2) GO TO 366
22590      IF(N,NE.1) GO TO 366
22600      DL=HX
22610      DD=DL/QJ
22620      RQ=.002
22630      T1=0.
22640      T2=0.
22650      T3=1.
22660      R1=1.
22670      ZD=-DL*.5+AJ*DD
22680 366      ZE=ZD/R1
22690      PXL=X(L)+ZE*T1
22700      PYL=Y(L)+ZE*T2
22710      PZL=Z(L)+ZE*T3
22720 370      A3(JJ)=0.
22730      B3(JJ)=0.
22740      IF(JQ,EQ.3,AND,JJ,NE.2) GO TO 360
22750      DO 350 JX=1,2
22760      AJX=JX
22770      U1=X1(K)-X(K)
22780      U2=Y1(K)-Y(K)
22790      U3=Z1(K)-Z(K)
22800      R0=SQRT(U1**2+U2**2+U3**2)
22810      DK=H0(K)/AS
22820      IF(JX-1) 352,352,355
22830 352      IF(MV,NE.2,OR,H,NE.1) GO TO 353
22840      DK=HX
22850      U1=0.
22860      U2=0.
22870      U3=1.
22880      R0=1.

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22890      PXK=X(K)
22900      PYK=Y(K)
22910      PZK=Z(K)-DK
22920      GO TO 354
22930 353    DKR=DK*ZK/RO
22940      PXK=X(K)+DKR*U1
22950      PYK=Y(K)+DKR*U2
22960      PZK=Z(K)+DKR*U3
22970 354    DR=DK/RO
22980      PX1=PXK+DR*U1
22990      PY1=PYK+DR*U2
23000      PZ1=PZK+DR*U3
23010      GO TO 358
23020 355    IF(MV,NZ.1,OR,M,NZ,WSK) GO TO 356
23030      DK=HX
23040      U1=0.
23050      U2=0.
23060      U3=1.
23070      RO=1.
23080      PXK=X1(K)
23090      PYK=Y1(K)
23100      PZK=Z1(K)
23110      GO TO 357
23120 356    PXK=PX1
23130      PYK=PY1
23140      PZK=PZ1
23150 357    DR=DK/RO
23160      PX1=PXK+DR*U1
23170      PY1=PYK+DR*U2
23180      PZ1=PZK+DR*U3
23190 358    DX=XK*DK
23200      CS=COS(DX)
23210      SN=SIN(DX)
23220      P1=PX1-PXK
23230      P2=PY1-PYK
23240      P3=PZ1-G-PZK
23250      P4=PX1-PX1
23260      P5=PY1-PY1
23270      P6=PZ1-G-PZ1
23280      ZH=(P1*U1+P2*U2+P3*U3)/RO
23290      IF(ABS(ZH),LT.1.E-15) ZH=0.
23300      C=P1**2+P2**2+P3**2+RQ**2
23310      IF((C-ZH**2)-RQ**2) 666,666,667
23320 666    SD=RQ; GO TO 668
23330 667    SD=SQRT(C-ZH**2)
23340 668    DX=PXK+ZH*U1/RO
23350      DY=PYK+ZH*U2/RO
23360      DZ=PZK+ZH*U3/RO
23370      WX=(PX1-DX)/SD
23380      WY=(PY1-DY)/SD
23390      WZ=(PZ1-G-DZ)/SD
23400      R4=SQRT(C)

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23410      R5=SQRT(P4**2+P5**2+P6**2+RQ**2)
23420      XR=XK*R4
23430      SR=SIN(XR)
23440      CR=COS(XR)
23450      XT=XK*R5
23460      ST=SIN(XT)
23470      CT=COS(XT)
23480      ZI=ZH-DK*(2,-AJX)
23490      IF(ABS(ZI),LT.1.E-15) ZI=0.
23500      WS=ZI*ZI
23510      IF(JX-1) 380,380,384
23520 380    WD=R5*R5
23530      WR=XT*WD
23540      E1=30.*((-SR/R4+CS*ST/R5)/SN-ZI*(ST-XT*CT)/WR)
23550      E2=30.*((-CR/R4+CS*CT/R5)/SN-ZI*(CT+XT*ST)/WR)
23560      E3=30.*((ZH*SR/R4-ZI*CS*ST/R5)/SN-(XT*WS*CT+(WD-WS)*ST
23570      1 )/WR)/SD
23580      E4=30.*((ZH*CR/R4-ZI*CS*CT/R5)/SN-((WD-WS)*CT-XT*WS*ST
23590      1 )/WR)/SD
23600      GO TO 386
23610 384    WD=R4*R4
23620      WR=XR*WD
23630      E1=30.*((-ST/R5+CS*SR/R4)/SN+ZI*(SR-XR*CR)/WR)
23640      E2=30.*((-CT/R5+CS*CR/R4)/SN+ZI*(CR+XR*SR)/WR)
23650      ZI=ZH-DK
23660      E3=30.*((-ZH*CS*SR/R4+ZI*ST/R5)/SN+(XR*WS*CR+(WD-WS)*SR
23670      1 )/WR)/SD
23680      E4=30.*((-ZH*CS*CR/R4+ZI*CT/R5)/SN+((WD-WS)*CR-XR*WS*SR
23690      1 )/WR)/SD
23700 386    EX=E3*WX+E1*U1/R0
23710      FX=E4*WX+E2*U1/R0
23720      EY=E3*WY+E1*U2/R0
23730      FY=E4*WY+E2*U2/R0
23740      EZ=E3*WZ+E1*U3/R0
23750      FZ=E4*WZ+E2*U3/R0
23760      A3(JJ)=((EX*T1+EY*T2)*G+EZ*T3)/R1+A3(JJ)
23770 350    B3(JJ)=((FX*T1+FY*T2)*G+FZ*T3)/R1+B3(JJ)
23780 360    CONTINUE
23790      IF(KS-LS) 362,364,362
23800 362    EF=A3(2)*(DD+DE)
23810      EG=B3(2)*(DD+DE)
23820      GO TO 368
23830 364    CALL FUN(DD,DE,A3,EF,JQ)
23840      CALL FUN(DD,DE,B3,EG,JQ)
23850 368    AQ(MN)=-EF
23860      BQ(MN)=-EG
23870      AM=1.
23880      GO TO 57
23890 *      ***4 PULSE EXPANSION AND IMPULSE TESTING FOR
23900 *      ***RADIUS NOT LESS THAN 0.02 WAVE LENGTH
23910 *      ***-----FOR Z-DIRECTED WIRE ONLY
23920 329    PZL=Z(L)+DL*ZL

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23930      PL=1.
23940      IF(G) 330,335,335
23950 330    PL=-1.
23960 335    R33=DK*.5
23970      R43=DL*.5
23980      XX=X(K)-X(L)
23990      YY=Y(K)-Y(L)
24000      S3(1)=PZK-PZL*G
24010      S3(2)=S3(1)+R33+R43
24020      S3(3)=S3(1)-R33-R43
24030      S3(4)=S3(1)+R33-R43
24040      S3(5)=S3(1)-R33+R43
24050      OX=OME*XMU*DK*DL
24060      DO 60 I=1,5
24070      ZZ(I)=S3(I)
24080      C=XX**2+YY**2+ZZ(I)**2+RA(L)**2
24090      ZJ=ZZ(I)*ZZ(I)
24100      AA=C-ZJ
24110      B=SQRT(C)
24120      ABZ=ABS(ZZ(I))
24130*
24140*      ***DISTANCE BETWEEN 2 PULSES NOT LESS THAN
24150*      ***10*0.25*LENGTH OF SUBSECTION ?
24160*
24170      IF(B-10.*ALP) 42,38,38
24180*
24190*      ***THIN WIRE APPROXIMATION
24200*
24210 38      ACOS=COS(XK*B)/(2.*AK*B)
24220      BSIN=-SIN(XK*B)/(2.*AK*B)
24230      ZR2=ZJ/C
24240      IF(ZR2.LT.1,E=10) ZR2=0.
24250      ZR4=ZR2*ZR2
24260      DR2=ALP*ALP/C
24270      H=(-1.+3.*ZR2)/6.+(3.-30.*ZR2+35.*ZR4)/40.*DR2
24280      A2=-ZR2/6.-DR2*(1.-12.*ZR2+15.*ZR4)/40.
24290      A2=A2*1.E5
24300      XZR=1.E5*XD*ZR4/120.
24310      PSI1=1.+DR2*H+XD*(A2+XZR)*1.E-5
24320      PSI2=XKD*(H+XD*(3.*ZR2-5.*ZR4)/60.)*ALP/B
24330      GO TO 50
24340*
24350*      ***CONSTANT CURRENTS ARE ASSUMED OVER THE SURFACE
24360*      ***OF THE CYLINDER INSTEAD OF OF A FILAMENT
24370*
24380 42      C=AA*2.+ZJ
24390      B=SQRT(C)
24400      ACOS=COS(XK*B)/AK
24410      BSIN=-SIN(XK*B)/AK
24420      A0=XL*B*.5
24430      A1=(1.-XL*C*.5)/AKL
24440      A2=-XL*.5/AKL

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24450      B0=XK*(-.5*XL*(C*.25+(ALP*ALP/3.+C*AA)/12.))
24460      B1=XK*B*(1.-XL*C/6.)/AKL
24470      B2=-XK*XL*B*.5/AKL
24480      DO 45 MZ=1,N5
24490      BN=MZ-1
24500      ZP=ALP*((BN+BN)/AN-1.)
24510      ZX=ZZ(I)-ZP
24520      Z3=4.*AA+ZX*ZX
24530      Z2=SQRT(Z3)
24540      P=4.*AA/Z3
24550      B3(MZ)=ELE(P)*Z2
24560      IF(ABZ-AP1) 45,45,39
24570 39      A3(MZ)=ELK(P)/Z2
24580 45      CONTINUE
24590      CALL FUN(AW,AW,B3,B5,N5)
24600      IF(ABZ-AP1) 46,46,44
24610 44      CALL FUN(AW,AW,A3,A5,N5)
24620      GO TO 48
24630 46      AI=1.
24640      IF(ABZ-1,Z=5) 52,53,53
24650 52      AI=2
24660 53      DO 47 MZ=1,N6
24670      BN=MZ-1
24680      TP=AK*.25*BN/CW
24690      S=SIN(TP)
24700      Y3=ALP*ALP+AA*S*S*AI*AI
24710      Y2=ALP+SQRT(Y3)
24720      Y7=Y2/(AI*RA(L))
24730 47      A3(MZ)=ALOG(Y7)
24740      CALL FUN(CW,CW,A3,A4,N6)
24750      A5=AI*(.5*AK*BLO+2.*A4)*.5
24760 48      PSI1=A0+A1*A5+A2*B5
24770      PSI2=B0+B1*A5+B2*B5
24780*
24790*      ***CALCULATE THE FIELD AT THE POSITIONS OF WIRES FROM
24800*      ***FOUR PULSE CURRENT EXPANSIONS
24810*
24820 50      AP(I)=ACOS*PSI1-BSIN*PSI2
24830      BP(I)=BSIN*PSI1+ACOS*PSI2
24840 60      CONTINUE
24850 56      AQ(MN)=-OX*BP(1)+(BP(4)+BP(5)-BP(2)-BP(3))/OMF
24860      BQ(MN)=OX*AP(1)-(AP(4)+AP(5)-AP(2)-AP(3))/OMF
24870      GO TO 68
24880 64      AQ(MN)=AQ(MN+2)
24890      BQ(MN)=BQ(MN+2)
24900 68      AM=.75
24910      IF(MN-1) 55,55,54
24920 54      IF(MN-4) 57,55,55
24930 55      AM=.25
24940*
24950*      ***CALCULATE TOTAL FIELD FROM 4 PULSE OR 2 HALF SIN
24960*      ***CURRENTS (CC,CD)

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24970*
24980 57 CC=AQ(MN)*AM+CC
24990 69 CD=BQ(MN)*AM+CD
25000 IF(KK,EQ,2) GO TO 76
25010 IF(KS,NE,LS,OR,NL,EQ,0) GO TO 41
25020 IF(KQ,GT,2) GO TO 41
25030 IF(LQ,EQ,3,OR,LQ,EQ,15) GO TO 49
25040 41 IF(NL,EQ,26,OR,IT(KS),EQ,1000) GO TO 76
25050 IF(KP) 76,160,76
25060 160 IF(NB) 161,76,161
25070 161 IF(N-1) 167,166,167
25080 166 K3=K3+1
25090 167 C3(K3,N)=CC
25100 C4(K3,N)=CD
25110 LR(K3)=K
25120 GO TO 76
25130 49 C5(M,N)=CC
25140 C6(M,N)=CD
25150 GO TO 76
25160 37 I3=15
25170 IF(KQ,LT,15) I3=3
25180 I1=KM-NS(K)*(KQ-I3)
25190 J1=LN+NS(L)*(12+I3-KQ)
25200 GO TO 43
25210 40 I1=KM-JP
25220 J1=LN-JQ
25230 43 C1(KM,LN)=C1(I1,J1)
25240 C2(KM,LN)=C2(I1,J1)
25250 GO TO 78
25260 72 K1=KM-1
25270 L2=LN-1
25280 C1(KM,LN)=C1(K1,L2)
25290 C2(KM,LN)=C2(K1,L2)
25300 79 C1(LN,KM)=C1(KM,LN)
25310 C2(LN,KM)=C2(KM,LN)
25320 GO TO 78
25330*
25340* ***CALCULATE THE MATRIX ELEMENTS OF (C1,C2)
25350*
25360 76 C1(KM,LN)=CC+C1(KM,LN)
25370 C2(KM,LN)=CD+C2(KM,LN)
25380 IF(KK,EQ,1,AND,(NL,NE,26,AND,NK,NE,26)) GO TO 79
25390 78 CONTINUE
25400 455 CONTINUE
25410 460 CONTINUE
25420 80 CONTINUE
25430 324 CONTINUE
25440 325 CONTINUE
25450*
25460* ***ADD THE LOAD A2,B2
25470*
25480 DO 90 M=1,NM

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25490      I=L1(M)
25500      C1(I,I)=C1(I,I)+AZ(M)
25510 90    C2(I,I)=C2(I,I)+BZ(M)
25520*
25530*      ***INVERT THE MATRIX C1,C2
25540*
25550      MY=MM
25560 98    DO 105 I=1,MY
25570 105   LR(I)=I
25580      DO 118 M=1,MY
25590      K=M
25600      DO 102 I=M,MY
25610      A1=C1(I,M)*C1(I,M)+C2(I,M)*C2(I,M)
25620      A2=C1(K,M)*C1(K,M)+C2(K,M)*C2(K,M)
25630      IF(A1-A2) 102,102,106
25640 106   K=I
25650 102   CONTINUE
25660      LS=LR(M)
25670      LR(M)=LR(K)
25680      LR(K)=LS
25690      STOR1=C1(K,M)
25700      STOR2=C2(K,M)
25710      SD=STOR1*STOR1+STOR2*STOR2
25720      DO 107 J=1,MY
25730      STO1=C1(K,J)
25740      STO2=C2(K,J)
25750      C1(K,J)=C1(M,J)
25760      C2(K,J)=C2(M,J)
25770      C1(M,J)=(STO1*STOR1+STO2*STOR2)/SD
25780 107   C2(M,J)=(STO2*STOR1-STO1*STOR2)/SD
25790      C11=C1(M,M)
25800      C1(M,M)=(C1(M,M)*STOR1+C2(M,M)*STOR2)/SD
25810      C2(M,M)=(C2(M,M)*STOR1-C11*STOR2)/SD
25820      DO 118 I=1,MY
25830      IF(I-M) 112,118,112
25840 112   ST1=C1(I,M)
25850      ST2=C2(I,M)
25860      C1(I,M)=0
25870      C2(I,M)=0
25880      DO 110 J=1,MY
25890      C1(I,J)=C1(I,J)-C1(M,J)*ST1+C2(M,J)*ST2
25900      C2(I,J)=C2(I,J)-C2(M,J)*ST1-C1(M,J)*ST2
25910 110   CONTINUE
25920 118   CONTINUE
25930      DO 109 J=1,MY
25940 114   LRJ=LR(J)
25950      DO 113 I=1,MY
25960      T1=C1(I,LRJ)
25970      T2=C2(I,LRJ)
25980      C1(I,LRJ)=C1(I,J)
25990      C2(I,LRJ)=C2(I,J)
26000      C1(I,J)=T1

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26010 113 C2(I,J)=T2
26020 L=LR(J)
26030 LR(J)=LR(LR(J))
26040 LR(LR(J))=L
26050 IF(J-LR(J)) 114,109,114
26060 109 CONTINUE
26070 300 IPIN=0
26080*
26090* ***CALCULATE THE CURRENT AC,BC
26100*
26110 314 DO 65 I=1,MH
26120 AC(I)=0
26130 BC(I)=0
26140 DO 51 J=1,NH
26150 ABV=AV(J)**2+BV(J)**2
26160 IF(ABV.LT.1.E-8) GO TO 51
26170 K=IF(J)
26180 AC(I)=AC(I)+C1(I,K)*AV(J)-C2(I,K)*BV(J)
26190 BC(I)=BC(I)+C1(I,K)*BV(J)+C2(I,K)*AV(J)
26200 51 CONTINUE
26210 65 CONTINUE
26220*
26230* ***CALCULATE THE INPUT POWER PIN
26240*
26250 PIN=0.
26260 MX=1
26270 AA=1
26280 DO 246 I=1,NH
26290 K=IF(I)
26300 IF(NB.NF.0) GO TO 244
26310 IF(I.EQ.1) GO TO 242
26320 II=I-1
26330 MX=MX+NS(II)
26340 242 IF(K.EQ.MX.AND.ABS(Z(I)).LT.1.E-5.AND.IG.EQ.1) AA=.5
26350 244 PIN=PIN+AA*(AC(K)*AV(I)+BC(K)*BV(I))
26360 246 CONTINUE
26370 IF(IG.EQ.0) APIN=PIN
26380 IF(IG.EQ.0) GO TO 316
26390 IPIN=IPIN+1
26400 IF(IPIN.GT.1) GO TO 316
26410 PSQ=SQRT(APIN/PIN)
26420 DO 312 I=1,NH
26430 AV(I)=AV(I)*PSQ
26440 312 BV(I)=BV(I)*PSQ
26450 IF(IPIN.EQ.1) GO TO 314
26460 316 IF(IC.EQ.0) GO TO 70
26470*
26480* ***CALCULATE AND WRITE OUT THE COUPLING COEFFICIENT
26490*
26500* WRITE(2,63)
26510 WRITE(6,63)
26520 63 FORMAT(// ' COUPLING COEFFICIENT' )

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26530*      WRITE(2,120)
26540      WRITE(6,120)
26550 120    FORMAT(/' ANTENNA NO.          POWER RECEIVED (DB)')
26560      M=0
26570      DO 140 I=1,NB
26580      NX=1
26590      IF(IT(I).EQ.197) NX=26
26600      IF(IT(I).EQ.1097) NX=5
26610      PRE=0.
26620      DO 130 K=1,NX
26630      M=M+1
26640      IF(NX.EQ.26.AND.K.GT.2) GO TO 130
26650      J=L1(M)
26660      PRE=PRE+AZ(M)*(AC(J)*AC(J)+BC(J)*BC(J))
26670 130    CONTINUE
26680      IF(I.EQ.IW.OR.IT(I).EQ.1000) GO TO 140
26690      AA=PRE/PIN
26700      ADB=-100.
26710      IF(AA.GT.1.E-10) ADB=10.*ALOG10(AA)
26720*      WRITE(2,125) I,ADB
26730      WRITE(6,125) I,ADB
26740 125    FORMAT(I6,13X,F10.2)
26750 140    CONTINUE
26760 70     IF(IFP.EQ.0) GO TO 82
26770*
26780*      ***CALCULATE AND WRITE OUT THE VERTICAL RADIATION PATTERN
26790*
26800      WRITE(6,71)
26810*      WRITE(2,71)
26820 71     FORMAT(/' VERTICAL PATTERN')
26830*      WRITE(2,73) APHI
26840      WRITE(2) 4,1,APHI
26850      WRITE(6,73) APHI
26860 73     FORMAT(/' PHI=',F7.1)
26870 74     FORMAT(/' THETA      NMAG      MMAG(DB)')
26880      AIT=181.
26890      IF(IG.EQ.1) AIT=90.
26900      AMAX=0.
26910      ATH=0.
26920      IY=1
26930      CALL PATT(APHI,ATH,IW,AIT,AINT,AMAX,APIN,ALT,IY,PA)
26940*      WRITE(2,74)
26950      WRITE(6,74)
26960      CALL MPAT(AMAX,AIT,AINT,MFP)
26970 82     IF(IPT.EQ.0) GO TO 83
26980*
26990*      ***CALCULATE AND WRITE OUT THE HORIZONTAL RADIATION PATTERN
27000*
27010      WRITE(6,201)
27020*      WRITE(2,201)
27030 201    FORMAT(/' HORIZONTAL PATTERN')
27040*      WRITE(2,81) ATHE

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27050      WRITE(2)5,1,ATHE
27060      WRITE(6,81) ATHE
27070 81    FORMAT(/' THETA=',F7.1)
27080 85    FORMAT(/' PHI      NMAG      NMAG(DB)')
27090      AMAX=C.
27100      IY=2
27110      AIP=360.
27120      APH=0.
27130      CALL PATT(APH,ATHE,IW,AIP,AIMP,AMAX,APIN,ALT,IY,PA)
27140*      WRITE(2,85)
27150      WRITE(6,85)
27160      CALL NPAT(AMAX,AIP,AIMP,NFP)
27170*
27180*      ***CALCULATE AND WRITE OUT THE PATTERN DISTRIBUTION
27190*
27200      IF(DPER.GT.1.E-3) CALL PATD(DPER,IDB,NFP)
27210 83    IF(IRG.EQ.0) GO TO 100
27220*
27230*      ***READ DATA IN SCREEN-FILE
27240*      ***CALCULATE AND WRITE OUT THE COMMUNICATION RANGE CONTOUR
27250*
27260*      WRITE(2,86)
27270      WRITE(6,86)
27280 86    FORMAT(/' COMMUNICATION RANGE CONTOUR')
27290*      WRITE(2,99) (ALT(I),I=1,NA)
27300      WRITE(6,99) (ALT(I),I=1,NA)
27310 87    FORMAT(/' PHI(DEG)',12X,'RANGE(NM)')
27320*      WRITE(2,87)
27330      WRITE(6,87)
27340 99    FORMAT(/' ALT(FT)',6F8.1/(9X,6F8.1))
27350      IY=3
27360      CALL PATT(APHI,ATHE,IW,AIT,AIMP,AMAX,APIN,ALT,IY,PA)
27370 100   CONTINUE
27380      STOP
27390      END
27400$      FORTRAN
27410*
27420*      ***SUBROUTINE PATT - TO CALCULATE RADIATION PATTERN
27430*
27440      SUBROUTINE PATT(APHI,ATHE,IW,AIT,AINT,AMAX,PIN,ALT,IY,PA)
27450      COMMON X,Y,Z,X1,Y1,Z1,HC,NS,FP,AK,IG,NN,NB,AC,BC,IT,AZ,NA,RNG
27460 1      ,GREL,TRANSL,ANTEL,DTA,BTA,DBM,IPP,IFT,IRG
27470      DIMENSION X(200),Y(200),Z(200),HO(200),NS(200),AC(500),RNG(6),
27480 1      PA(40),Y1(200),Y1(200),Z1(200),IT(20),AZ(361),BC(500).
27490 2      ALT(6),ATH(6),GX(3),GY(3),GZ(3)
27500      IMG=IG
27510      BK=AK*FP/3.E8
27520      B2=2.*3437.76*6080.
27530      R2=R2*.5*.3048*4./3.
27540      FX=1.E-7*AK*FP
27550      J1=0
27560 70    J1=J1+1

```

USAPAT



```

27570      IF(IFP.EQ.1.AND.IY.EQ.1) GO TO 31
27580      IF(IFT.EQ.1.AND.IY.EQ.2) GO TO 34
27590      IF(IRG.EQ.1) GO TO 38
27600*
27610*      ***VERTICAL PATTERN- CONSTANT PHI, VARY THETA
27620*
27630 31      IF(J1.NE.1) ATHE=ATHE+AIMT
27640          GO TO 36
27650*
27660*      ***HORIZONTAL PATTERN-CONSTANT THETA,VARY PHI
27670*
27680 34      IF(J1.NE.1) APHI=APHI+AIMT
27690*
27700*      ***FIND PHI, THETA IN RADIANS(PHI,THE)
27710*
27720 36      PHI=APHI/57.29578
27730          THE=ATHE/57.29578
27740          GO TO 39
27750*
27760*      ***COMMUNICATION RANGE-READ LINE OF SIGHT DATA
27770*
27780 38      READ(3,J1) ZZ,ELANG,DIST,RNG
27790          IF(ZZ.GT.9998./57.29578) GO TO 100
27800          AX=DTA*SIN(BTA)
27810          AY=DTA*COS(BTA)
27820          SX=DIST*SIN(ZZ)*.3048
27830          SY=DIST*COS(ZZ)*.3048
27840          ATS=SQRT((SX-AX)**2+(SY-AY)**2)
27850*
27860*      *** FIND PHI,THETA IN RADIANS
27870*
27880          PHI=ATAN2((SX-AX),(SY-AY))
27890          IF(PHY.LT.0.) PHI=PHI+2.*3.1415927
27900          HSCRN=DIST*.3048*SIN(ELANG+DIST/R2)/COS(ELANG+DIST/R2)+TRANEL
27910          TTH=ATAN2(HSCRN-ANTEL-FA(IW),ATS)-ATS*.75/(R2*.3048)
27920          THE=3.141593*.5-TTH
27930 39      M=0
27940*
27950*      ***CALCULATE COORDINATES
27960*
27970          CP=COS(PHI)
27980          CT=COS(THE)
27990          SP=-SIN(PHI)
28000          ST=SIN(THE)
28010          AE=0.
28020          BE=0.
28030          NX=NB
28040          IF(NB.EQ.0) NX=NM
28050          I=0
28060          DO 20 KS=1,NX
28070              WK=1
28080              MK=0

```

```

28090      IF(NB.EQ.0) GO TO 3
28100      IF(IT(KS).EQ.1097) NK=5
28110      IF(IT(KS).EQ.197) NK=26
28120      IF(NK.EQ.26.AND.KS.EQ.IW) NK=1
28130 3      DO 20 KQ=1,NK
28140      MW=0
28150      I=I+1
28160      IF(NK.NE.26) GO TO 56
28170      IF(KQ-14) 50,50,54
28180 50      IF(KQ.EQ.2) GO TO 56
28190      MW=1
28200      GO TO 56
28210 54      MW=3
28220 56      IF(I-1) 10,10,45
28230 45      IF(MK.EQ.0) GO TO 5
28240      IF(KQ.GT.3.AND.KQ.NE.15) GO TO 10
28250 5      JJ=I-1
28260      M=M+NS(JJ)
28270 10      NSI=NS(I)
28280      NG=1
28290      IF(IG) 12,14,12
28300 12      IF(Z(I)) 14,13,14
28310 13      NG=0
28320 14      AN=NSI+NG
28330      IF(KQ.GT.14) NG=0
28340      IF(NK.EQ.26.AND.KQ.NE.2) AN=AN-1.
28350      DO 20 J=1,NSI
28360      A1=J-2+NG
28370      B=M+J
28380      DO 20 L=1,3
28390      AX=L
28400      KK=1
28410      A=A1+AX*.5
28420      IF(L.NE.2) GO TO 32
28430      A2=1.
28440      IF(MW.EQ.1.AND.J.EQ.NSI) KK=2
28450      IF(MW.EQ.3.AND.J.EQ.1) KK=2
28460 32      BB=KK
28470      DO 20 K=1,KK
28480      IF(J.NE.1.AND.L.EQ.1) GO TO 35
28490      T1=X1(I)-X(I)
28500      T2=Y1(I)-Y(I)
28510      T3=Z1(I)-Z(I)
28520      DK=HO(I)/AN*.5
28530      IF(MW.NE.1.OR.J.NE.NSI) GO TO 60
28540      IF(KK.NE.2.AND.L.NE.3) GO TO 60
28550 58      T1=0.
28560      T2=0.
28570      T3=1.
28580      DK=.0075
28590      GO TO 65
28600 60      IF(MW.NE.3.OR.J.NE.1) GO TO 65

```

```

28610      IF(KK,EQ.1,AND,L,NE,3) GO TO 58
28620 65    R0=SQRT(T1*T1+T2*T2+T3*T3)
28630      DA=DK*A*2./R0
28640      PX=X(I)+DA*T1
28650      PY=Y(I)+DA*T2
28660      PZ=Z(I)+DA*T3
28670      IF(MW,EQ.1,AND,J,EQ,NSI) PX=X1(I)
28680      IF(MW,EQ.1,AND,J,EQ,NSI) PY=Y1(I)
28690      IF(MW,EQ.1,AND,J,EQ,NSI) PZ=Z1(I)+(AX-2.)*DK
28700      SS=DK*.5*3.141593
28710      IF(L,NE,2) A2=.5
28720      PD=A2*DK/BB
28730      DT=(T1*CT*CP+T2*CT*SP)/R0
28740      DS=-T3*ST/R0
28750      PS=BK*(PX*CP+PY*SP)*ST
28760      P3=COS(PS)
28770      P4=SIN(PS)
28780      PQ=BK*CT*PZ
28790      P5=SIN(PQ)
28800      P6=COS(PQ)
28810 35    P1=P3*AC(N)-P4*BC(N)
28820      P2=P3*BC(N)+P4*AC(N)
28830      AGTD=0.
28840      BGTD=0.
28850      GX(L)=PX
28860      GY(L)=PY
28870      GZ(L)=PZ
28880*
28890*    ***FIND WHETHER IMAGE FIELDS EXIST (IMG=1), OR NOT (IMG=0)
28900*
28910      IF(L,NE,3,OR,K,NE,1) GO TO 24
28920*
28930*    CALCULATE COORDINATE GX,GY,GZ OF THESEGMENTS FOR GTD
28940*    *** (FOR FUTURE USE)
28950*
28960      GX(1)=2.*GX(1)-GX(2)
28970      GY(1)=2.*GY(1)-GY(2)
28980      GZ(1)=2.*GZ(1)-GZ(2)
28990      GX(3)=2.*GX(3)-GX(2)
29000      GY(3)=2.*GY(3)-GY(2)
29010      GZ(3)=2.*GZ(3)-GZ(2)
29020*
29030*    ***GTD IS NOT CONSIDERED
29040*    ***FIND DIFFRACTION FIELDS BY GTD (AGTD,BGTD)
29050*    *** (FOR FUTURE USE)
29060 24    CONTINUE
29070      AA=IMG
29080      XF(J-1) 17,15,17
29090 15    IF(Z(I)) 17,16,17
29100 16    AA=0.
29110 17    AP=1.+AA
29120      AH=1.-AA

```



```

29130      QS=P5*(DT*AP+DS*AM)
29140      QC=P6*(DT*AM+DS*AP)
29150*
29160*      ***CALCULATE RADIATION PATTERN E(AE,BE)
29170*
29180      AE=AE-(P1*QC-P2*QS)*DD+AGTD
29190      BE=BE-(P1*QS+P2*QC)*DD+EGTD
29200 20    CONTINUE
29210      BB=AE*AE+BE*BE
29220      AZ(J1)=FX*SQRT(BB)
29230*
29240*      ***COMMUNICATION RANGE CONTOUR-IY=3,IRG=1
29250*
29260      IF(IRG,EQ.1,AND,IY,EQ.3) GO TO 72
29270      IF(AZ(J1),GT,AMAX) AMAX=AZ(J1)
29280      IF(IFP,EQ.1,AND,IY,EQ.1,AND,ATHE,LE,AIT+.001-AINT) GO TO 70
29290      IF(IPT,EQ.1,AND,IY,EQ.2,AND,APHI,LE,AIT+.001-AINT) GO TO 70
29300      GMAX=AMAX*AMAX/PIW/30.
29310      GDB=10.*ALOG10(GMAX)
29320*
29330*      ***WRITE RADIATION PATTERN AMAX,GMAX,GDB
29340*
29350*      WRITE(2,280) AMAX,GMAX,GDB
29360      WRITE(6,280) AMAX,GMAX,GDB
29370      WRITE(2)2,3,AMAX,GMAX,GDB
29380 280    FORMAT(/' EMAX=',F8.3,' GAIN=',F7.3,' GAIN(DB)=' ,F6.2)
29390      GO TO 100
29400*
29410*      ***CALCULATE RANGES FROM THE ANTENNA ,RNG
29420*
29430 72      RRR=AZ(J1)/(BK*SQRT(120.*DBH))
29440      DO 80 I=1,NA
29450      UU=RNG(I)*1852./R3
29460      VV=ALT(I)*.3048+GREL+R3
29470      WW=ANTEL+FA(IW)+R3
29480      RR=SQRT(VV**2+WW**2-2.*WW*VV*COS(UU))
29490      ALP=1.
29500      IF(RRR,GT,VV-WW) ALP=(WW**2+VV**2-RRR**2)/(2.*WW*VV)
29510      PPP=ARCOS(ALP)
29520      IF(RRR,LT,RR) RNG(I)=R3+PPP/1852.
29530      RG=1.E-5
29540      IF(RNG(I),GT,1.E-8) RG=RNG(I)*1852.
29550      QQ1=(ALT(I)*.3048+GREL-ANTEL-FA(IW))/RG
29560      QQQ=ATAN(QQ1)-RG/(R3*2.)
29570      IF(RR,LT,RRR) QQQ=TTH
29580      ATH(I)=QQQ*57.29578
29590 80      CONTINUE
29600      APHI=FPHI*57.29578
29610      ATHE=90.-THE*57.29578
29620*      WRITE(2,74) APHI,(RNG(I),I=1,NA)
29630      WRITE(6,74) APHI,(RNG(I),I=1,NA)
29640 74      FORMAT(F7.2,1X,6F8.1/(6F8.1))

```

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29650      GO TO 70
29660 100   RETURN
29670      END
29680$     FORTRAN
29690*
29700*     ***SUBROUTINE FUN - NUMERICAL INTEGRATION
29710*
29720      SUBROUTINE FUN(DD,DE,Y9,SUM,NDIM)
29730      DIMENSION Y9(13)
29740      SUM=0
29750      NDH=NDIM/2+1
29760      DO 10 I=2,NDIM
29770      HH=.5*DE
29780      IF(I.LE,NDH) HH=.5*DD
29790      SUM=SUM+HH*(Y9(I)+Y9(I-1))
29800 10     CONTINUE
29810      RETURN
29820      END
29830$     FORTRAN
29840*
29850*     ***FUNCTION ELE - ELLIPTIC INTEGRAL OF SECOND KIND
29860*
29870      FUNCTION ELE(P)
29880      IF(P-1.) 3,5,4
29890 4       WRITE(6,100) P
29900      STOP
29910 100    FORMAT(10X,'ILLEGAL ARGUMENT FOR ELE. ARG=',E13.4)
29920 5      ELE=1.
29930      RETURN
29940 3      AM1=1.-P
29950      ELE=1.+AM1*(.4630151+.1077812*AM1-(.2452727+.0412496
29960      X *AM1)*ALOG(AM1))
29970      RETURN
29980      END
29990$     FORTRAN
30000*
30010*     ***FUNCTION ELK - ELLIPTIC INTEGRAL OF FIRST KIND
30020*
30030      FUNCTION ELK(P)
30040      IF(P-1.) 3,4,4
30050 4       WRITE(6,100) P
30060      STOP
30070 100    FORMAT(10X,'ILLEGAL ARGUMENT FOR ELK. ARG=',E13.4)
30080 3      AM1=1.-P
30090      ELK=1.386294+AM1*(.1119723+.0725296*AM1)-(1.5+AM1*
30100      X (.1213478+.0288729*AM1))*ALOG(AM1)
30110      RETURN
30120      END
30130$     FORTRAN
30140*
30150*     ***SUBROUTINE PXYZ - TO CALCULATE POSITION (X,Y,Z), (X1,Y1,Z1)
30160*

```

USAFUN

USAELE.

USAELEK

USAPXY

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30170      SUBROUTINE PXYZ
30180      COMMON X,Y,Z,X1,Y1,Z1,H0,NS,FP,AK,IG,WN,NB,AC,BC,IT,AZ,NA,RNG
30190      1 ,GBEL,TRANEL,ANTEL,DTA,BTA,DBM,IFP,IFT,IRG
30200      DIMENSION H0(200),X(200),Y(200),Z(200),X1(200),Y1(200),
30210      1 Z1(200),NS(200),AC(500),BC(500),IT(20),AZ(361),RNG(6)
30220      NX=WN
30230      IF(NB) 2,2,1
30240*
30250*      ***ENTER ANTENNA TYPE FOR THE SIMPLE PROGRAM ANTENNA
30260*
30270 1      IF(NB.NE.0) READ(1,20) (IT(I),I=1,NB)
30280      NX=NB
30290      TH0=150.
30300      PH0=0.
30310      THX=TH0*.0174533
30320      C=COS(THX)
30330      SIT=SIN(THX)
30340 2      L=0
30350      DO 319 LS=1,NX
30360      NK=1
30370      IF(NB.EQ.0) GO TO 318
30380      IF(IT(LS).EQ.1097) NK=5
30390      IF(IT(LS).EQ.197) NK=26
30400 318      DO 315 LQ=1,NK
30410      L=L+1
30420      ALS=LQ
30430      IF(NB.EQ.0) GO TO 305
30440      IF(IT(LS).NE.197) GO TO 305
30450      IF(LQ=2) 305,305,303
30460 303      IF(LQ=14) 312,312,308
30470*
30480*      ***CALCULATE ANTENNA POSITION (X,Y,Z),(X1,Y1,Z1)FOR GENERAL
30490*      ***PROGRAM ANTENNA AND SUB-ANTENNA WIRE #1,2 OF
30500*      ***SIMPLE PROGRAM ANTENNA
30510*
30520 305      X1(L)=X(L)
30530      Y1(L)=Y(L)
30540      Z1(L)=Z(L)+H0(L)
30550      GO TO 315
30560*
30570*      ***CALCULATE (X1,Y1,Z1) FOR SUB-ANTENNA #15-26
30580*
30590 308      PH1=30.*(ALS-15.)*PH0
30600      PHX=PH1*.0174533
30610      X1(L)=X(L)+H0(L)*COS(PHX)
30620      Y1(L)=Y(L)+H0(L)*SIN(PHX)
30630      Z1(L)=Z(L)
30640      GO TO 315
30650*
30660*      ***CALCULATE (X1,Y1,Z1),(X,Y,Z) FOR SUB-ANTENNA#3-14
30670*
30680 312      PH1=30.*(ALS-3.)*PH0

```



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30690      PHX=PH1*.0174533
30700      X1(L)=X(L)
30710      Y1(L)=Y(L)
30720      Z1(L)=Z(L)
30730      X(L)=X1(L)+H0(L)*SIT*COS(PHX)
30740      Y(L)=Y1(L)+H0(L)*SIT*SIN(PHX)
30750      Z(L)=Z1(L)+H0(L)*C
30760 315  CONTINUE
30770 319  CONTINUE
30780 20   FORMAT(15,15I4)
30790      RETURN
30800      END
30810$     FORTRAN
30820*
30830*     ***SUBROUTINE QZP - TO CALCULATE SIZE OF MATRIX USABLE AGAIN
30840*
30850      SUBROUTINE QZP(K1,L8,II,L9,MX,MZ,KX,MP)
30860      COMMON X,Y,Z,X1,Y1,Z1,H0,NS,FP,AK,IG,NN,NB,AC,BC,IT,AZ,NA,RNG
30870      1 ,GREL,TRANEL,ANTEL,DTA,BTA,DBM,IFP,IFT,IRG
30880      DIMENSION X(200),Y(200),Z(200),H0(200),NS(200),AC(500),
30890      1 BC(500),X1(200),Y1(200),Z1(200),IT(20),MP(20),AZ(361),
30900      2 RNG(6),J=0
30910      DO 20 I=KX,K1
30920      J=J+MP(I)
30930 20   CONTINUE
30940      MX=II-J
30950      MZ=0
30960      M1=L9+1
30970      M2=L9+L8
30980      DO 50 J=M1,M2
30990      MZ=MZ+NS(J)
31000 50   CONTINUE
31010      RETURN
31020      END
31030$     FORTRAN
31040*
31050*     ***SUBROUTINE WPAT - TO CALCULATE NORMALIZED RADIATION PATTERN
31060*
31070      SUBROUTINE WPAT(AMAX,AIT,AINT,I)
31080      COMMON X,Y,Z,X1,Y1,Z1,H0,NS,FP,AK,IG,NN,NB,AC,BC,IT,AZ,NA,RNG
31090      1 ,GREL,TRANEL,ANTEL,DTA,BTA,DBM,IFP,IFT,IRG
31100      DIMENSION X(200),Y(200),Z(200),X1(200),Y1(200),Z1(200),
31110      1 H0(200),NS(200),AC(500),BC(500),AZ(361),IT(20),RNG(6)
31120*
31130*     ***INCREASE ATH FROM 0 TO AIT, THE ANGLE RANGE OF RADIATION
31140*     ***PATTERN CONCERNED
31150*
31160      I=0
31170      ATH=-AINT
31180 10   ATH=ATH+AINT
31190      I=I+1
31200*

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USAOZP

USAWPA

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31210*   ***NORMALIZE THE RADIATION PATTERN
31220*
31230       FM=AZ(I)/AMAX
31240       IF(FM.LT.1.E-5) GO TO 252
31250       FDB=20.*ALOG10(FM)
31260       GO TO 254
31270 252   FDB=-1000.
31280*
31290*   ***PRINT OUT THE NORMALIZED RADIATION PATTERN
31300*
31310 254   WRITE(6,88) ATH,FM,FDB
31320       WRITE(2)3,3,ATH,FM,FDB
31330*254   WRITE(2,88)ATH,FM,FDB
31340       IF(ATH.LE.AIT+.001-AINT) GO TO 10
31350 88     FORMAT(F5.0,F10.4,F10.2)
31360       RETURN
31370       END
31380$      FORTRAN
31390*
31400*   ***SUBROUTINE PATD - TO CALCULATE PATTERN DISTRIBUTION
31410*
31420       SUBROUTINE PATD(DPER,IDB,NFP)
31430       COMMON X,Y,Z,X1,Y1,Z1,HC,NS,FP,AK,IG,NN,NB,AC,BC,IT,AZ,NA,RNG
31440       1 ,GREL,TRANEL,ANTEL,DTA,BTA,DBM,IFP,IFT,IRG
31450       DIMENSION X(200),Y(200),Z(200),H0(200),NS(200),AC(500),
31460       & RNG(6),X1(200),Y1(200),Z1(200),IT(20),AZ(361),BC(500)
31470       NX=NFP-1
31480*
31490*   ***RE-ORDER AZ IN INCREASING MAGNITUDE
31500*
31510       DO 20 I=1,NX
31520       BMAX=0.
31530       K=I
31540       DO 10 J=I,NX
31550       IF(AZ(J).LE.BMAX) GO TO 10
31560       BMAX=AZ(J)
31570       K=J
31580 10     CONTINUE
31590       AZ(K)=AZ(I)
31600       AZ(I)=BMAX
31610 20     CONTINUE
31620       NDIV=100./DPER
31630       ANDIV=NX-1
31640       ND=NDIV+2
31650       AND=ND-2
31660*       WRITE(2,25)
31670       WRITE(6,25)
31680 25     FORMAT('///' PATTERN DISTRIBUTION'//')
31690*
31700*       ***IDB=-1 :%,MAG
31710*       ***IDB=0 :%,MAG, DB
31720*       ***IDB=1 :%,DB

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USAPAD

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31730*
31740      IF(IDB.EQ.-1) WRITE(6,55)
31750*      IF(IDB.EQ.-1) WRITE(2,55)
31760      IF(IDB.EQ.0) WRITE(6,65)
31770*      IF(IDB.EQ.0) WRITE(2,65)
31780      IF(IDB.EQ.1) WRITE(6,75)
31790*      IF(IDB.EQ.1) WRITE(2,75)
31800 55      FORMAT('  X      MAG')
31810 65      FORMAT('  X      MAG'      (DB)')
31820 75      FORMAT('  X      (DB)')
31830*
31840*      ***CALCULATE PERCENTAGE P, MAGNITUDE G , DB H
31850*
31860      PP=DPER*AND
31870      IF(PP.GT.99.99) ND=ND-1
31880      DO 40 J=1,ND
31890      AJ=J-1
31900      A=DPER*ANDIV*.01*AJ+1.
31910      NP=A
31920      NQ=NP+1
31930      B=NQ
31940      P=DPER*AJ
31950      IF(P.GT.100.01) P=100.
31960      F=(AZ(NP)-AZ(NQ))*(B-A)+AZ(NQ)
31970      G=F/AZ(1)
31980      IF(P.GT.100.01) G=0.
31990      IF(J.EQ.1) G=1.
32000      IF(G.GE.1.E-5) GO TO 35
32010      N=-100.
32020      GO TO 38
32030 35      N=20.*ALOG10(G)
32040 38      IF(IDB.EQ.-1) WRITE(6,50) P,G
32050*      IF(IDB.EQ.-1) WRITE(2,50) P,G
32060      IF(IDB.EQ.0) WRITE(6,60) P,G,H
32070*      IF(IDB.EQ.0) WRITE(2,60) P,G,H
32080      IF(IDB.EQ.1) WRITE(6,70) P,H
32090*      IF(IDB.EQ.1) WRITE(2,70) P,H
32100 40      CONTINUE
32110 50      FORMAT(F6.1,F9.3)
32120 60      FORMAT(F6.1,F9.3,F10.2)
32130 70      FORMAT(F6.1,F10.2)
32140      RETURN
32150      END
32160$      ENDEDIT

```



# APPENDIX II

## Program cross-reference

<u>FILEDIT NAME</u>	<u>DECK NAME</u>	<u>SYMDEF</u>
LNKMNA	LINKMN	LINKMN
LNKM1A	LINKM1	LINKM1
LNKM2A	LINKM2	LINKM2
LNKM3A	LINKM3	LINKM3
DSTRTP	.....	originally ..... changed to DSTPLT
DSTRP1	PLOT	PLOT
Y.LABL	LABEL	LABEL
YSFUTL	YSFUTL	CALLTS and others
PACK	PACK	UNPACK and others
DIMXXX	DIMXXX	.....
USAMAI	MAIN	MAIN
USAPAT	PATT	PATT
USAFUN	FUN	FUN
USAELE	ELE	ELE
USAELE	ELK	ELK
USAPXY	PXYZ	PXYZ
USAQZP	QZP	QZP
USANPA	NPAT	NPAT
USAPAD	PATD	PATD

### APPENDIX III - GLOSSARY

**Adjustable dimensions** A facility of the FORTRAN language which allows the size of an array to be defined in a given routine and then passed to subordinate routines via the argument list, eliminating the need to define the size of the array again in each of the subordinate routines. Thus the dimensions of an array in a subroutine may be varied without actually modifying the subroutine itself.

DDO2, p. 2-16 thru 2-17

**ASCII** A particular standardized system which assigns certain binary bit patterns as representations for a set of graphic and control characters; these bit patterns are used internal to data processing equipment when the strings of symbols they represent are to be stored, transmitted, or manipulated. ASCII is one of the two native character sets of the Honeywell 600/6000 series computers (see also BCD) and may be accepted by programs written in the FORTRAN language on these machines. There are, however, certain pieces of software associated with FORTRAN which exist in two mutually exclusive forms, each designed to be compatible with a particular character set. As a result, it is sometimes necessary to

specify which of the two character sets is to be used; it may not be possible to use both character sets within a given program. There are, in addition, some routines designed to automatically convert characters of one set to those of another set; it may be possible or necessary to specify the use of these routines for certain applications.

DD02, p. 3-28 thru 3-29, A-1 thru A-3

DD07, sections I and IX

DD20, sections II and III

#### BATCH

One of the two major environments in which a program may execute on these computers (see also timesharing).

A batch job generally does not interact directly with a user at a remote terminal; it is not monitored or serviced by the TSS Executive; and it is not subject to certain constraints imposed upon jobs which do execute under the TSS Executive. Since batch programs are monitored and serviced by GCOS rather than by the TSS Executive, some functions which can be performed in the timesharing environment cannot be performed in the batch environment, and vice versa; in addition, the way in which certain functions are accomplished varies depending upon the environment. As in the case of character set differences (see ASCII above), there exist two mutually exclusive



versions of certain pieces of software, each designed to work in a particular environment. This may again necessitate specification of the environment in which the program will operate; it may not operate in the same fashion in a different environment.

DD07, sections I and IX

DD20, sections II and III

#### BCD

A system by which a set of graphic symbols may be represented as a string of binary bits. This is one of the two representation systems native to the Honeywell 600/6000 series computers (see also ASCII).

DD02, p. 3-28 thru 3-29, A-1 thru A-3

DD07, sections I and IX

DD20, sections II and III

#### Binary file

A file which has been created by a binary write statement or other process which does not employ format conversion. Such files will often contain information in its internal binary representation, and do not usually contain character information such as headings, textual messages, or spaces between data items. Binary files are used primarily where data will be used as input to another program and will not ordinarily be examined by a human being. The information is in a form which is readily machine-readable and which does not require conversion from its

external format to the internal binary format of the machine; it is not readily human-readable (see also formatted file).

DD02, p. 5-14

DD20, p. 2-4 thru 2-8

#### Binary number

Numbers are generally converted from their external, human-readable form (a string of characters) into a binary form which is more convenient for internal arithmetic manipulations. The format of this internal representation is detailed in the reference.

BN86, p. 1-20 thru 1-28

#### Buffer

In order to improve the efficiency of I/O operations, data transmitted to or from an I/O device is accumulated in an arbitrarily-chosen area of memory referred to as a buffer. When data is being transferred to a file (a WRITE operation), data is accumulated in the buffer until the buffer becomes full; the data is then written to the I/O device (called "flushing" the buffer) and the process repeats. Because of this buffering process, it is sometimes necessary to take explicit action to "flush" a buffer or "close" a file, a process which includes flushing the buffer and marking the end of the data just written on the I/O device. These flushing and closing operations transfer the last portion of data from the buffer to

the I/O device, so that the information of the I/O device is complete and up to date.

DD07, section VI

DD20, p. 2-37 thru 2-38, 2-44 thru 2-50

#### CALLSS

CALLSS is a mnemonic for a function performed by the TSS Executive. The mnemonic is used in conjunction with the DRL machine operation, which causes a transfer of control to the TSS Executive, which then preserves the state of the program which executed the DRL CALLSS and invokes the specified timesharing subsystem on the program's behalf. Upon termination of the subsystem, the TSS Executive reinstates the suspended program.

DD17, p. 3-9

#### CARDIN

A timesharing subsystem which facilitates spawning of batch jobs from timesharing.

DD21, section II

#### DOMDECK

A compressed source deck. The format is basically that of the corresponding source deck, but with most of the blanks removed. Control information is added to allow the deleted blanks to be reinserted; identification and error detection data is also added.

BN86, p. 2-5 thru 2-6

#### Command Loader

A timesharing subsystem capable of restoring and placing in execution properly prepared programs in



	<p>H* format. The command loader is invoked whenever a system-selection or build-mode command is not recognized as being valid by the TSS Executive.</p> <p>DD17, p. 5-1 thru 5-3</p>
COMMON	<p>Blank COMMON will normally be loaded just above the batch slave prefix, starting at location 100 octal. If, as in the case of a job which is to execute in timesharing, blank COMMON must be relocated, several methods are available. These are discussed in the loader manual. Labeled COMMON, on the other hand, is loaded in the same area as the program instructions. It is not usually necessary to take extraordinary action to specify the size or location of labeled COMMON (but the loader has facilities for this should it be required).</p> <p>DD02, p. 4-13 thru 4-14</p> <p>DD10, sections II thru IV</p>
Control Card	See JCL
Deck Name	<p>The name punched in columns 73 thru 80 of a COMDECK or an OBJECT DECK. This name comes from the LBL pseudo-operation of a GMAP program, or from the initial COMMENT card of a FORTRAN program or from its initial SYMDEF, in the absence of an initial SYMDEF, in the absence of an initial COMMENT. This name appears at the top of each page of a FORTRAN</p>

compilation listing following the word LABEL, and appears on the \$ OBJECT card of the object deck resulting from the compilation or assembly. This \$ OBJECT card may be printed out in subsequent activities which use the object deck.

BN86, p. 6-12

DD02, p. 2-4

**DRL** (Pronounced DERAIL.) A machine instruction which causes a program interruption. When this instruction is executed by a timesharing program, the TSS Executive gains control of the CPU and interprets the interruption as a request for service. The exact nature of the service is specified by information accompanying the DRL instruction.

BN86, p. 1-15 thru 1-20, 4-118

DD17, p. 3-6 thru 3-54

**DRLSAV** A particular function associated with the DRL instruction. Saves a program on a disk file in H\* format.

DD17, p. 3-23 thru 3-24

**Entry point** A point at which execution of instructions within a particular routine is to begin. A given routine may have one or more entry points, usually defined by a SYMDEF. When a program is loaded by GELOAD, CALL statements are linked with the corresponding

entry points, and a single entry point for the program as a whole is determined. This will usually be the beginning of the main program, which has an implied entry name of six dots (.....). When an H\* file is created, the entry point for the element that is saved on the file is written to the file, so that execution can be initiated at the proper location when the element is restored.

BN86, p. 6-27 thru 6-27, 6-63 thru 6-67

DD02, p. 4-30, 4-37 thru 4-39, 4-60 thru 4-61

DD10, p. 4-1

DD31, p. 2-39

#### FDUMP

A timesharing subsystem which allows the user to examine or modify a disk file in its entirety, regardless of the content, format, or characteristics of the file. The contents are displayed in octal.

DD21, section IV

#### File Control Block

A group of words located in an arbitrary section of the user's memory space, used by GFRC to record the characteristics and status of a file on an I/O device. There is one file control block for each file used by a given program.

DD07, section IV

DD10, section XI

DD20, p. 2-37 thru 2-38, 2-44 thru 2-50



## FILEDIT

A batch mode system program, capable of invoking various compilers, for creating, maintaining, listing and retrieving source and object program libraries.

BJ71, all sections

## FILEDIT Name

The name which appears in columns 73 thru 80 of the \$ language card (\$ GMAP, \$ FORTRAN, etc.) preceding each source program deck. This is the name used by the source file editor (FILEDIT) to access source programs (the object file editor portion of FILEDIT uses the DECK NAME from the \$ OBJECT card). Note that the FILEDIT NAME, DECK NAME, and SYMDEF of a program are not necessarily the same; the FILEDIT NAME is used throughout this document to refer to the individual programs of the DISTORT system.

BJ71, sections VII thru XIII

## Formatted file

A file which is subjected to format conversion, in contrast to a BINARY FILE. A formatted file contains information in the form of a string of characters; before this information can be used by the computer, it must undergo format conversion, in which numeric data, represented on the file as a string of numeric characters, decimal points, and exponent designators, is converted to an equivalent internal binary representation (see BINARY NUMBER).

The opposite conversion must be performed when the data is written to the file, along with the addition of information to control the carriage of the line printer or remote terminal printer.

DD02, p. 5-14

DD20, p. 2-12 thru 2-16, 2-39 thru 2-40

#### **FORTRAN Library**

##### **Routine**

Any of the numerous subroutines, called either explicitly or implicitly, which perform various services for the FORTRAN program. Many of these routines in turn make use of library routines which make up GFRC, or they may, directly or indirectly, utilize the services of the operating system (GCOS and/or the TSS Executive).

DD02, p. 6-11 thru 6-49

DD20, all sections

#### **GCOS**

An operating system which monitors the operation of, and provides services to, all jobs operating in the batch environment. In the case of the RADC machine, GCOS is subordinate to another operating system called MULTICS. MULTICS monitors and services GCOS, much as GCOS monitors and services batch programs, and in so doing provides better security measures than those afforded by GCOS alone. MULTICS is not used on the AFCS H6060.

DD19, all sections

## GELOAD

The main loader for Honeywell 600/6000 series machines. It is invoked in batch by the \$ EXECUTE card; its input consists of object decks and control cards which modify the loading process or pass information to the loader; its primary output is a program, linked and relocated, ready for execution. GELOAD also produces a memory map to indicate where various programs have been loaded in core; GELOAD may be used to create H\* files.

DD10, all sections

## General Loader

See GELOAD.

## GERSTR

A particular function associated with the MME instruction. Causes a program saved on a file in H\* format to be restored (placed back in core).

DD19, p. 4-52

## GESAVE

A particular function associated with the MME instruction. Saves a program on a disk file in H\* format.

DD19, p. 4-53

## GFRC

A set of routines which interfaces with the operating system (GCOS or TSS Executive) to provide basic services to a program with respect to I/O.

DD07, all sections

## H\* file

A random disk file upon which a program has been written (saved) in contemplation of placing that



program in core and executing it at some later time. A program which resides on an H\* file has already been loaded, relocated, and linked by GELOAD; thus the program appears on the H\* file as an exact image of the program as it will appear in core. The file contains only the minimum amount of control information necessary to restore the program (place it in core) and initiate its execution. An H\* file is created by a MME GESAVE or DRL DRLSAV; GELOAD can be used to accomplish the MME GESAVE. The file upon which the links of a linked or overlayed program are saved is an H\* file.

BS18, Appendix B, Random Storage Format

DD10, section VIII

#### HIGHLOAD

A mode of operation wherein GELOAD places the instructions and data in the highest address locations of the memory segment specified by the \$ LIMITS control card. Any unused space will then be at the lower address locations. This is the normal mode of operation for GELOAD.

DD10, section II

#### JCL

Job control language. This is a term borrowed from IBM, and refers to the card images which define the attributes of a batch job to the operating system and to any other system programs which require this

information. On the Honeywell 600/6000 series computers, these card images are defined by the presence of the character \$ in the first column; blanks in the second thru seventh; a verb beginning in column 8; and any applicable options beginning in column 16.

DD31, all sections

Linking loader See GELOAD. So called because separate subroutines are linked together during the loading process, wherever a correspondence exists between the name of an entry point and the name used in a function or subroutine call.

DD10, all sections

Loader See GELOAD

LOWLOAD A mode of operation wherein GELOAD places the instructions and data in the lower address locations of the memory segment specified by the \$ LIMITS card. See also HIGHLOAD.

DD10, section II

Master Mode A mode of operation available to the Honeywell 600/6000 series CPU wherein a program can exercise maximum control over the system hardware, accessing any portion of memory physically present and operating any I/O device. This mode of operation is used only by the operating systems and a restricted

set of system programs; user programs operate in SLAVE MODE, wherein the segment of memory which can be accessed is limited, and certain machine instructions relating to I/O and system control are rendered inoperable. This protects the operating system and other user's programs and data from inadvertent or malicious misuse or destruction.

BN86, p. 1-5

DD19, p. 1-4 thru 1-5, section IV

**Memory layout** Reference shows the physical position of various items in the user's memory space.

DD10, section II

DD19, section V

**MME** A machine instruction which causes a program interruption. When this instruction is executed by a batch program, GCOS gains control of the CPU and interprets the interruption as a request for service. The exact nature of the service is specified by the information accompanying the MME instruction.

BN86, p. 1-15 thru 1-20, 4-117

DD19, section IV

**Object deck** A card deck, or image of that deck on a disk or tape file, which is the primary output of a compiler or assembler. Consists of machine language instructions and data which make up a program,



along with identification and error detection information, and control information which allows GELOAD to properly load, relocate, link, and initiate execution of the program.

BN86, p. 2-4 thru 2-7

DD10, sections II and III

#### PSEUDO

A particular function associated with the DRL instruction. Causes data to be copied from the user's memory into the keyboard input buffer maintained by the TSS Executive, thereby simulating input from the keyboard of a remote terminal.

DD17, p. 3-20

#### Random library

A random disk file containing a collection of frequently used programs. A random library is created by the program RANLIB and is used as input to GELOAD. The random library contains essentially the same information as the collection of object decks from which it was created, but in a slightly different format and with the addition of a directory to aid in locating the required object deck. When a random library is supplied to GELOAD, the directory of the library file is searched at certain times to find programs which are required but which have not been loaded previously.

DA97, section III

	DD10, section V
<b>RANLIB</b>	A program which generates random libraries.
	DD42, section III
<b>RESTOR</b>	A particular function associated with the DRL instruction. Causes a program saved on a file in H* format to be restored (placed back in core).
	DD17, p. 3-21 thru 3-22
<b>Save name</b>	The name used to save or restore a program on an H* file. This name must be specified whenever a MME GESAVE, MME GERSTR, DRL DRLSAV, or DRL RESTOR is used; some other means of restoring a program from an H* file, such as the COMMAND LOADER, may or may not require the use of a save name. The save name is used primarily to distinguish between program elements when more than one program element is saved on a single H* file.
	DD02, p. 3-14, 3-22 thru 3-25, 6-43
	DD10, section VII
	DD17, p. 3-21 thru 3-24, 5-1 thru 5-5
	DD19, p. 4-3 thru 4-4, 4-52 thru 4-53
	DD20, p. 3-11 thru 3-12
	DD31, p. 2-130
<b>SELECTA</b>	The \$ SELECTA card image causes CARDIN to insert the contents of the file specified in the variable field into the JCL stream at that point, when a

batch job is spawned from timesharing via CARDIN.

Note that this is somewhat different from the  
\$ SELECT card.

DD21, p. 2-16

#### Slave prefix

An area in locations 0 thru 77 octal (0 thru 143 octal in timesharing) of the user's memory space which is reserved for the use of the operating system. It is used to communicate between the user program and the operating system, and portions of this area may be used as temporary storage by the operating system.

DD10, section II

DD17, p. 3-1 thru 3-3.2

DD19, section V

#### Slave program

A program which operates in slave mode as opposed to master mode. User programs operate in slave mode.

DD19, p. 1-4 thru 1-5, 4-1

#### SYMDEF

Symbol definition. A SYMDEF defines the name and location of an entry point or data area, so that this location can be referenced by a separately compiled or assembled program. SYMDEFs are generated primarily by compilers and assemblers, and are placed in object decks to enable GELOAD to perform the linking process.



	BN86, p. 6-27 thru 6-28, 6-63 thru 6-67
	DD10, p. 4-1
	DD31, p. 2-39, 2-196 thru 2-197
System standard format	A particular format used by GFRC for recording data on an I/O device. Most sequential files are recorded in system standard format.
	DD02, p. 3-29
	DD07, p. 3-1 thru 3-3
Timesharing	A system which allows interactive use of a computer by several users at once; see also TSS Executive and BATCH.
	DD22, all sections
TSS Executive	A sub-operating system which operates subordinate to GCOS, performing basically the same functions as GCOS, but tailored to a timesharing environment.
	DD17, all sections
	DD22, all sections
Unformatted file	See BINARY FILE.

## APPENDIX IV

### References

<u>Publication</u>	<u>Date</u>	<u>Title</u>
BJ71	Rev 0	Oct 71
	Add A	Jun 72
	Add B	Dec 72
	Add C	May 73
BN86	Rev 2	Mar 73
	Add A	May 73
BS18	Rev 1	May 72
	Add A	May 73
DA97	Rev 0	Jan 72
	Add A	Jun 72
	Add B	Jan 73
DD02	Rev 0	Jan 75
DD07	Rev 0	Apr 74
	Add A	Jan 75
DD10	Rev 0	Mar 74
DD17	Rev 0	Mar 74
	Add A	Jan 75
DD19	Rev 0	Apr 74
	Add A	Mar 75
DD20	Rev 0	May 75
DD21	Rev 0	Apr 74
	Add A	Jan 75

<u>Publication</u>	<u>Date</u>	<u>Title</u>
DD22 Rev 0	Apr 74	Time Sharing System General Information Manual
Add A	Jan 75	
Add B	Apr 75	
DD31 Rev 0	Mar 74	Control Cards Reference Manual
Add A	Jan 75	



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